PAGE'S WEEKLY

A Weekly Newspaper Devoted to the Engineering, Shipbuilding, Iron and Steel Trades.

OFFICES: CLUN HOUSE, SURREY STREET, STRAND, LONDON, W.C.

No. 81. VOL. 8.
Registered as a Newspaper.

LONDON, FRIDAY, MARCH 30, 1906.

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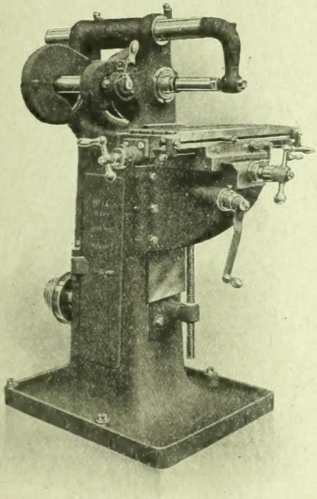

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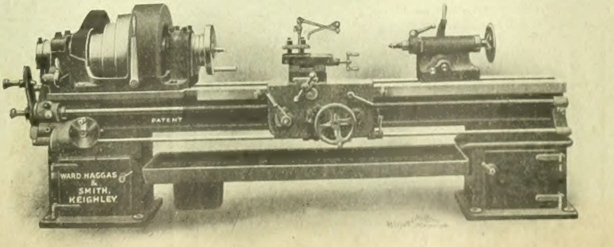

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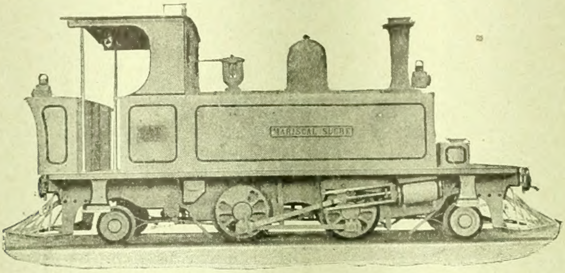

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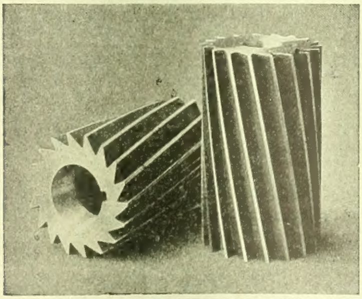

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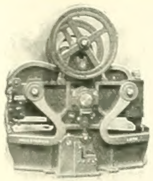

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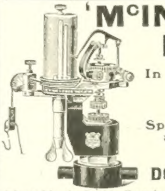

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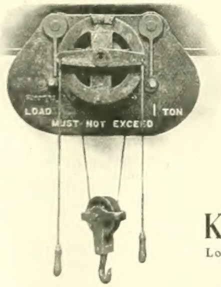

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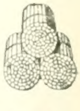

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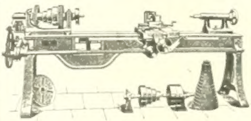

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—*Iron and Coal Trades Review.*

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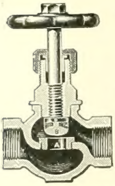

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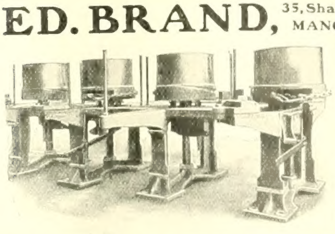

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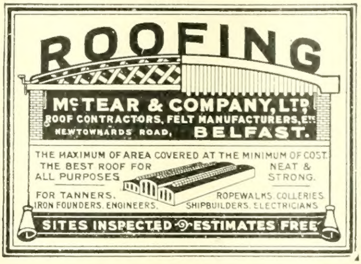

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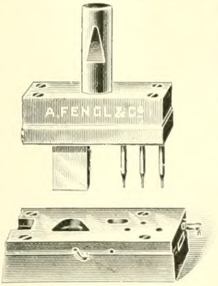

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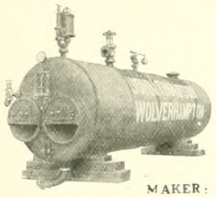

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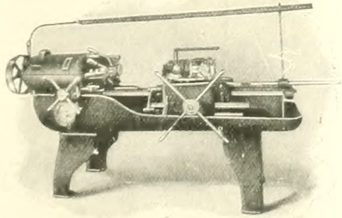

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PAGE'S WEEKLY Contracts

CONTRACTS.

CITY AND COUNTY BOROUGH OF BELFAST.

TRAMWAYS AND ELECTRICITY DEPARTMENT.

The Tramways and Electricity Committee of the Belfast Corporation are prepared to receive TENDERS for

COAL AND ASH CONVEYING PLANT, BUNKERS, AND CHAIN GRATE MECHANICAL STOKERS.

Specification, with Form of Contract, may be obtained from the undersigned, on payment of Two Guineas, which will be refunded provided a *bona fide* Tender has been sent and not withdrawn.

Sealed Tenders, endorsed "Conveying Plant," shall be lodged with Sir Samuel Black, Town Hall, Belfast, not later than 11 a.m on Monday, the 16th day of April, 1906.

The Council do not bind themselves to accept the lowest or any Tender.

VICTOR A. H. M'COWEN, M.Inst.E.E., M.I.Mech.E.,
City Electrical Engineer, Belfast.

WALLASEY URBAN DISTRICT COUNCIL.

ELECTRICITY DEPARTMENT.

The Wallasey Urban District Council are prepared to receive TENDERS FOR THE UNDERMENTIONED EXTENSIONS TO BUILDINGS AND PLANT:—

1. An Extension to the Engine and Boiler House at the Generating Station, Seaview Road, Liscard, Cheshire.

The Drawings can be inspected, and a copy of the Specification and Quantities procured, at the Electrical Engineer's Office, on the site, on payment of £2 2s., which will be refunded on receipt of a *bona fide* Tender.

2. The Supply and Delivery on seat of New Boilers; also
3. A 500 kilowatt Steam-Driven-Single-Phase Alternator, to be delivered and fixed at the Generating Station, as above.

Copies of Specification for Nos. 2 and 3 may be obtained at the Engineer's office on payment of One Guinea, to be returned on receipt of a *bona fide* Tender.

All Tenders, addressed to the undersigned, and endorsed Tender for "Buildings," "Boilers," or "Steam Generator," as the case may be, to be delivered per post at my office, as below, not later than noon on Wednesday, the 18th day of April, 1906.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
H. W. COOK,
Clerk and Solicitor to the Council.

Public Offices, Egremont, Cheshire,
March 17th, 1906.

THE CORPORATION OF MIDDLETON

are prepared to receive TENDERS for the CONSTRUCTION OF THREE CIRCULAR TANKS, CATCHPITS, CONDUITS, &c., at their Sewage Outfall Works at Rhodes.

Plans may be seen and Specifications, Quantities, and Form of Tender (which includes a fair wages clause) obtained on and after the 5th day of April, 1906, by applying to W. Welburn, Esq., Borough Surveyor, at the Town Hall, between 9.30 and 10.30 a.m., on depositing £1 1s., which will be returned after a *bona fide* Tender is received.

Tenders, endorsed "Tender for Tanks," are to be addressed to the Chairman of the Surveyor's Committee, and delivered at my office on or before Monday, the 30th day, April, 1906.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE, Town Clerk.

Town Hall, Middleton,
March 12th, 1906.

CITY OF LEEDS.—ELECTRIC LIGHTING DEPARTMENT.

TURBO-ALTERNATORS, CONDENSERS, &c.

The Electricity Committee of the Leeds City Council are prepared to receive TENDERS for PLANT as below—

One or Two Sets of Electric Generating and Condensing Plant, each comprising a Steam Turbine, Two-phase Alternator and Exciter of 3,000 kw. capacity, Electrically driven Surface Condensing Plant, and the necessary Pipes and Valves.

Tenders must include the whole of the work specified, as offers of separate sections will not be considered. Preference will be given to Tenders for Plant of British Manufacture. Copies of the General Conditions, Specification, and Form of Tender, may be obtained from Mr. Harold Dickinson, Manager of the Department, 1, Whitehall Road, Leeds, on payment of a deposit of Two Guineas, which will be refunded on receipt of a *bona fide* Tender.

Tenders must be in the form attached to the Specification, and must be delivered to me at the Town Hall, Leeds, not later than 10 o'clock in the forenoon, on Monday, the 9th day of April, 1906, in sealed envelopes, endorsed "Electric Lighting—Tender for Generating Plant."

The Corporation do not bind themselves to accept the lowest or any of the Tenders sent in.

ROBERT E. FOX,
Town Clerk.

Leeds, February 22nd, 1906.

COUNTY BOROUGH OF SUNDERLAND.

ELECTRICITY DEPARTMENT.

TO MANUFACTURERS OF STEEL, COPPER, AND CAST-IRON PIPES.

The Corporation of Sunderland are prepared to receive TENDERS for the Supply and Erection of—

STEAM EXHAUST AND OTHER PIPES in connection with the extension of their Hylton Road Electricity Station.

The Specification and Form of Tender can be obtained on application to the Borough Electrical Engineer, Mr. John F. C. Snell, M.Inst.C.E., at his office, Town Hall, Sunderland, and on payment of a deposit of £1 1s. (One Guinea), which will be returned on receipt of a *bona fide* Tender.

Sealed Tenders, addressed to the "Chairman of the Electricity and Lighting Committee," Town Hall, Sunderland, must be delivered at my office not later than 12 o'clock noon on Wednesday, the 4th day of April, 1906. Tenders to be endorsed "Steam and other Pipes."

The Corporation do not bind themselves to accept the lowest or any Tender.

FRAS. M. BOWEY,
Town Clerk.

Town Hall, Sunderland, March 20th, 1906.

GREAT YARMOUTH UNION.

—The Great Yarmouth Board of Guardians are prepared to receive TENDERS for the following:—

Contract No. 1.—A WATER-SOFTENING PLANT.
" No. 2.—GAS ENGINE AND PUMPS.

Specifications and all particulars may be obtained on application to Mr. W. J. Carpenter, A.M.I.C.E., South Denes Road, Great Yarmouth on deposit of a cheque for £1 1s., returnable on receipt of a *bona fide* Tender.

Tenders, endorsed, to be addressed to "The Clerk, Great Yarmouth Board of Guardians," Queen Street, Great Yarmouth, and must be received by him through the post on or before noon on the 4th day of April, 1906.

The Great Yarmouth Board of Guardians do not bind themselves to accept the lowest or any Tender.

Great Yarmouth, March 21st, 1906.

CITY OF NORWICH.

TO STEAM AND HEATING ENGINEERS.

The ASYLUM COMMITTEE invites TENDERS for HEATING and HOT-WATER SUPPLY WORK at the Extensions of the City Asylum, Hellesdon, near Norwich.

Plans and Specifications may be seen and Forms of Tender obtained on application at my office on and after the 19th inst.

Tenders, on the forms supplied, enclosed in envelopes sealed with sealing wax, endorsed "Asylum Heating," and addressed to the Chairman of the Asylum Committee, must be delivered at my office not later than 12 at noon on Monday, April 9th next.

The Committee does not bind itself to accept any Tender.

ARTHUR E. COLLINS, M.Inst.C.E.,
City Engineer, etc.

Guildhall, Norwich, March 10th, 1906.

THE Secretary of State for India in Council

is prepared to receive TENDERS from such persons as may be willing to SUPPLY—

1. SPRINGS (SPIRAL), &c.
2. SPRINGS (LAMINATED).
3. WHEELS AND AXLES FOR RAILWAY WAGONS.
4. W.I. BUFFERS FOR WAGONS.

The Conditions of Contract may be obtained on application to the Director-General of Stores, India Office, Whitehall, S.W., and Tenders are to be delivered at that office by Two o'clock p.m. on Tuesday, the 3rd April, 1906, after which time no Tender will be received.

E. GRANT BURLS,
Director-General of Stores.

India Office, Whitehall, March 21st, 1906.

HASLEMERE WATERWORKS, SURREY.

Contract No. 2

CAST-IRON CYLINDERS, PIPES, VALVES, HYDRANTS, &c.

The Hambledon Rural District Council is prepared to receive TENDERS for the SUPPLY of about 15 tons of CAST-IRON CYLINDERS, and about 260 tons of CAST-IRON SOCKET PIPES, together with a number of Sluice Valves, Air Valves, Hydrants, &c.

Copies of the Specification and Form of Tender can be obtained on and after Wednesday, the 21st inst., at the offices of Messrs. R. B. Grantham and Son, 23, Northumberland Avenue, London, W.C., on payment of a deposit of Two Guineas, which will be returned on receipt of a *bona fide* Tender.

Sealed Tenders, which must be on the prescribed form, and endorsed "Haslemere Waterworks," must be sent, addressed to me, the undersigned, Ferdinand Smallpeice, Clerk to the Council, Guildford, on or before Monday, the 2nd day of April next.

The Council do not undertake to accept the lowest or any Tender.

By order of the Council.
FERDINAND SMALLPEICE, Clerk.

139, High Street, Guildford,
March 17th, 1906.

PAGE'S WEEKLY Contracts and Appointments Open

BOROUGH OF DOVER.—ELECTRICITY DEPARTMENT.

The Corporation invite TENDERS for the SUPPLY of ONE RECTANGULAR-PATTERN SURFACE CONDENSER and ONE EDWARDS AIR PUMP, with requisite valves.

Specification, with General Conditions, form of Tender, &c., can be obtained from the Borough Electrical Engineer, Mr. L. W. WOODMAN, Electricity Works, Park Street, Dover, on payment of a deposit of One Guinea, which will be returned on receipt of a *bona fide* Tender, if the Tender is not accepted. Additional copies of Specifications, 2s. 6d. each.

Tenders, on the prescribed form, endorsed "Tender for Condensing Plant," to be delivered at my office on or before the 2nd April, 1906.

The Corporation do not bind themselves to accept the lowest or any tender.

WOLLASTON KNOCKER, Town Clerk.

Castle Hill House, Dover, March 21st, 1906.

HASLEMERE WATERWORKS (SURREY). CONTRACT No. 3.

EXTENSION OF HEADING IN WELL, LINING OF WELL, CONSTRUCTION OF RESERVOIR, AND LAYING C.I. PIPES, FIXING VALVES, &c.

The Hambledon Rural District Council is prepared to receive Tenders for Extending the present Heading in the Well, Lining the Well with C.I. Cylinders and Brickwork, Construction of Reservoir, Laying C.I. Pipes, Fixing Valves, &c.

Copies of the Specification and form of Tender can be obtained on and after Thursday, the 22nd inst. at the offices of Messrs. R. B. GRANTHAM AND SON, 23 Northumberland Avenue, London, W.C., on payment of a deposit of Three Guineas, which will be returned on receipt of a *bona fide* Tender.

Sealed Tenders, which must be on the prescribed form and endorsed "Haslemere Waterworks" must be sent addressed to me, the undersigned, FERDINAND SMALLPEICE, Clerk to the Council, Guildford, on or before Monday, the 9th day of April next.

The Council do not undertake to accept the lowest or any Tender.

By order of the Council,
FERDINAND SMALLPEICE, Clerk.

138, High Street, Guildford, March 17th, 1906.

GREAT WESTERN RAILWAY.

The Directors of this Company are prepared to receive TENDERS for the SUPPLY of about 200 tons of GIRDER WORK and other Steel and Iron Work of British manufacture.

Plans and Specification may be seen and forms of Tender and Bills of Quantities obtained at the office of the Engineer at this station, between the hours of 10 a.m. and 4 p.m.

Tenders, addressed to the undersigned, and marked outside "Tender for Girder Work," will be received on or before Tuesday, the 3rd April.

The Directors do not bind themselves to accept the lowest or any Tender. G. K. MILLS, Secretary.

Paddington Station, London, March 12th, 1906.

COUNTY BOROUGH OF SALFORD.

The Electricity Committee invite TENDERS for the Supply, Delivery, and Erection of a

750 kw. STEAM TURBO-GENERATOR AND CONDENSING PLANT.

Plans, Specification, and Form of Tender may be obtained from the Borough Electrical Engineer, Electricity Works, Frederick Road, Pendleton, on payment of a deposit of Two Guineas, which will be returned on receipt of a *bona fide* Tender. All inquiries in connection therewith to be addressed to the Borough Electrical Engineer at the above works.

Sealed Tenders endorsed "Tender for Turbo-Generator," to be delivered at the office of the undersigned on or before Saturday, April 21st, 1906.

The Committee do not bind themselves to accept the lowest or any Tender.

L. C. EVANS, Town Clerk, Salford.

Town Hall, Salford, March 19th, 1906.

MUNICIPAL COUNCIL OF SYDNEY, N.S.W.

ELECTRICITY DEPARTMENT.

The Council is prepared to receive TENDERS for the SUPPLY and ERECTION of—

A. BOILERS, AUTOMATIC STOKERS, PIPEWORK, &c.
B. TURBO-ALTERNATOR, SUB-STATION MACHINERY SWITCHBOARDS, &c.

Specifications, Plans, and Form of Tender may be obtained on application to Mr. T. ROOKE, at the offices of Messrs. Preece and Cardew, 8, Queen Anne's Gate, Westminster, on and after Monday, February 12th.

A deposit of Five Guineas will be required on application, which will be refunded on receipt of a *bona fide* Tender as directed, and a cash deposit or marked cheque for the sum of £1,000 will be required when the Tender is sent in.

Sealed Tenders, endorsed "Tender for Electric Lighting Plant," are to be addressed to the Town Clerk, Town Hall, Sydney, and must be delivered at the Town Hall on or before 4 p.m. Monday, May 7th, 1906.

The Council does not bind itself to accept the lowest or any Tender.

(Signed) THOMAS H. NESBITT, Town Clerk.

CITY OF NOTTINGHAM.

CONSTRUCTION OF NEW TRAMWAYS.

The City Council invite TENDERS for the SUPPLY and DELIVERY OF STEEL GIRDER TRAM RAILS, TRAMWAY POLES AND FITTINGS, AND GRANITE SETTS.

CONTRACT No. 1 will comprise the Supply and Delivery of 450 tons of Steel Tram Rails and 21 tons of Fishplates.

CONTRACT No. 2 will comprise the Supply and Delivery of 250 Tramway Poles and Fittings.

CONTRACT No. 3 will comprise the Supply and Delivery of 10,000 tons of 3in. by 5in. Granite Setts.

Drawings may be seen, and Copies of the Specifications and Forms of Tender may be obtained, on applying to Mr. ARTHUR BROWN M.Inst.,C.E., City Engineer, Nottingham, on payment of a deposit of One Guinea for each Contract, which will be returned on receipt of a *bona fide* Tender and a copy of the Specification.

Sealed Tenders endorsed "Tram Rails," "Tramway Poles," or "Granite Setts, as the case may be, are to be delivered to the undersigned on or before Saturday, March 31st instant.

The lowest or any Tender will not necessarily be accepted, and Tenders will only be accepted from firms who conform to the conditions of contract as regards paying the local standard rate of wages, &c., and to the working rules of the Nottingham district.

By order,
SAMUEL G. JOHNSON,
Town Clerk.

Guildhall, Nottingham, March 15th, 1906.

APPOINTMENTS OPEN.

INDIAN PUBLIC WORKS DEPARTMENT.

The Secretary of State for India in Council will, in the Summer of 1906, make not less than TEN APPOINTMENTS of ASSISTANT ENGINEER in the Permanent Establishment of the Indian Public Works Department, in addition to the appointments to be made from Cooper's Hill College.

The age of Candidates must not be less than 21, or more than 24 years on the 1st July, 1906.

A printed Form of Application, together with information regarding the conditions of the appointments and certain requirements laid down as to education and experience in engineering, may be obtained from the Secretary, Public Department, India Office, Whitehall, London, S.W.

The Form of Application is to be returned so as to reach him not later than Tuesday, 1st May next.

A. GODLEY,
Under Secretary of State.

India Office, December 19th, 1905.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATION.

ASSISTANT EXAMINERS IN THE PATENT OFFICE (20-25), April 5th.

The date specified is the latest at which applications can be received. They must be made on forms to be obtained, with full particulars, from the Secretary, Civil Service Commission, Burlington Gardens London, W.

BOMBAY, BARODA, AND CENTRAL INDIA RAILWAY COMPANY.

THE Directors are prepared to receive APPLICATIONS (by letter only) for APPOINTMENT as ASSISTANT ENGINEER in the Way and Works Department in India.

Candidates should not be more than 30 years of age, and must have received a good scientific education at a recognised engineering college, and have had thereafter at least a year's experience in practical work.

Salary: Rupees 350 per calendar month.

Terms: A three years' engagement and first-class free passage to India and home again (unless forfeited by misconduct).

The Candidate selected will be required to pass a medical examination by the Company's Consulting Physician before appointment.

Letters of application, marked "Assistant Engineer," with copies (not originals) of testimonials, should be addressed to the undersigned not later than the 3rd April next

T. W. WOOD, Secretary.

Offices, Gloucester House, Bishopsgate Street Without,
London, E.C., March 15th, 1906.

AN Examination of Candidates for direct entry as ENGINEER SUB-LIEUTENANTS in His Majesty Navy, will commence at the Royal Naval College, Greenwich, on May 30th, 1906.

Age 20 to 23.

Must have attended the regular day engineering course at a recognised college for technical education for not less than one college year, and have had at least three years' training in approved engineering establishments

Applications to compete to be made to Secretary, Admiralty Whitehall, London, before May 15th, 1906.

Buyers' Directory.

NOTE.—*The display advertisements of the firms mentioned under each heading can be found by ready reference to Alphabetical Index to Advertisers on pages 22 and 24.*

In order to assure fair treatment to advertisers, each firm is indexed under its leading speciality ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

Advertisers' Service Bureau.
British Advertiser Service Bureau, Queen Anne's Chambers, Westminster, S.W.

Artesian Well Machinery.
John Z. Thom, Patricroft, Manchester.

Band Sawing Machines.
Noble & Lund, Ltd., Felling-on-Tyne.

Bearings (Roller).
Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

Belting.
Binney & Son, Catherine Street, City Road, London, E.C.
Cort, Arthur, & Co., Camberwell, London, S.E.
Fleming, Birkby & Goodall, Ltd., West Grove, Halifax.
Gilmour, W. & O., St. John's Hill, Edinburgh.

Boilers.
Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.
Hartley & Sugden, Ltd., Halifax.
Thompson, John, Wolverhampton.

Boilers (Water-tube).
Babcock & Wilcox, Ltd., Oriel House, Farringdon Street, London, E.C.
Stirling Boiler Co., Ltd., Motherwell, N.B.

Bolts, Nuts, Rivets, etc.
Bayliss, Jones & Bayliss, Ltd., Monmore Green, Wolverhampton.
Herbert W. Periam, Ltd., Floodgate Street Works, Birmingham.
T. D. Robinson & Co., Ltd., Derby.

Books.
Griffin, Charles, & Co., Exeter Street, Strand, W.C.
King, P. S., & Co., 4, Great Smith Street, Westminster, S.W.
New Zealand Mines Record, Wellington, New Zealand.
Spon, E. & F. N., 125, Strand, W.C.

Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Cables.
Callender's Cable and Construction Co., Ltd.

Case-Hardening Compounds.
Hy. Miller & Co., Milgarth Works, Leeds.

Castings.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Catalogues, Printing, &c.
Atlantic Press, Ltd., Weymouth Street, Manchester.
Spottiswoode Advertising Agency, Clun House, Surrey Street, Strand, W.C.
Stafford, Arthur, & Co., Denton, Manchester.

Chucks.
Fairbanks Co., 78-80, City Road, London, E.C.

Cisterns, Tanks, &c.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.
Clayton, Son & Co., Ltd., Hunslet, Leeds.
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Clutches (Friction).
David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.

Condensing Plant.
Benn, Sykes, Haslingden, near Manchester.
Concentric Condenser, Ltd., 23, Northumberland Avenue, London, W.C.
Mirrlees-Watson & Co., Ltd., Glasgow

Consulting Engineers.
Gibbs, John, & Son, 80, Juke Street, Liverpool.
G. H. Hughes, A.M.I.M.E., 19, Old Queen Street, Westminster, S.W.
Melville & Macalpine, 615, Walnut Street, Philadelphia, Pa., U.S.A.
Mount-Haes, A., M.I.Mech.E., M.I.M.E., 11, Ironmonger Lane, London, E.C.

Continental Railway Arrangements.
Northern Railway of France.
South Eastern & Chatham Railway Co.

Conveying and Elevating Machinery.
Adolf Bleichert & Co., Leipzig-Gohlis, Germany.
Temperley Transporter Co., 72, Bishopsgate Street Within London, E.C.

Copper and Brass.
W. Hepton & Son, Hunslet Lane, Leeds

Coverings (Boiler).
Magnesia Covering Ltd., Washington Station, co. Durham.

Cranes, Travellers, Winches, etc.
Joseph Booth & Bros. Ltd. Rodley, Leeds.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Cranks.
Clarke's Crank & Forge Co., Ltd., Lincoln, England.

Cutters (Milling).
Coventry Ordnance Works, Ltd., Coventry.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.
E. G. Wrigley & Co., Ltd., Foundry Lane Works, Soho, Birmingham.

Destructors.
Heenan & Froude, 4, Chapel Walks, Manchester.
Horsfall Destructor Co., Ltd., Armley, Leeds.

Dredges and Excavators.
Delange & Cie, Mce., Hoboken, near Antwerp
Rose, Downs & Thompson, Ltd., Old Foundry, Hull.

Drilling Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne
Swift, George, Clarence Ironworks, Halifax.

Economisers.
E. Green & Son, Ltd., Manchester.

Ejectors (Pneumatic).
Hughes & Lancaster, 16, Victoria Street, London, S.W.

Electrical Apparatus.
Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.
British Westinghouse Electric and Manufacturing Co., Ltd., Norfolk Street, Strand, London, W.C.
Broadbent, T. W., Victoria Electrical Works, Huddersfield.
Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey Street, London, S.E.
Ebonestos Manufacturing Co., 22, Rosoman Street, London, E.C.
Gent & Co., Ltd., Faraday Works, Leicester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., Silvertown, London, E.
Johnson and Phillips, Ltd., Victoria Works, Old Charlton, Kent.
Matthews & Yates, Ltd., Swinton, Manchester.
Mix and Genest, Berlin, W., Germany.
Nalder Bros. & Thompson, 34, Queen Street, London, E.C.
New Gutta Percha Co., Ltd., Dashwood House, New Broad Street E.C.
Newton Brothers, Full Street, Derby.
Phœnix Dynamo Manufacturing Co., Bradford, Yorks.
Scott, E., & Mountain, Ltd., Newcastle-on-Tyne.
Turner, Atherton & Co., Ltd., Denton, Manchester.
B. Weaver & Co. (*see* Ebonestos Manufacturing Co.), 22, Rosoman Street, Clerkenwell, London, E.C.

Engineers' Supplies.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Engines (Gas).
Campbell Gas Engine Co., Ltd., Halifax.
Cundall, Son & Co., Ltd., Airedale Iron Works, Shipley.

Engines (Electric Lighting).
McLaren, J. and H., Midland Engine Works, Leeds.

Engines (Locomotive).
Barclay, Andrew, Sons & Co., Ltd., Caledonia Works, Kilmarnock, N.B.
Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.
Hunslet Engine Co., Ltd., Leeds, England.
Hudswell Clarke & Co., Ltd., Leeds, England.
McLaren, J. & H., Midland Engine Works, Leeds.

Engines (Oil).
Brown & May, Ltd., Devizes.

Engines (Stationary).
Mirrlees Watson Co., Ltd., Glasgow.

Engines (Traction).
Jno. Fowler & Co. (Leeds), Ltd., Steam Plough Works, Leeds.

Engravers.
Jno. Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

Exhaust Steam Oil Separators.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Fans, Blowers.
Capel Fan Co., 13, Moseley Street, Newcastle-on-Tyne.
Davidson & Co., Ltd., "Sirocco" Engineering Works, Belfast Ireland.
Gibbs, John & Son, 80, Juke Street, Liverpool.
Matthews & Yates, Ltd., Swinton, Manchester.

Fencing and Gates (Iron).
Bayliss, Jones & Bayliss, Ltd., Monmore Green, Wolverhampton.

Files.
Flecktor, Templin & Co., Ltd., Newhall Steel Works, Sheffield.

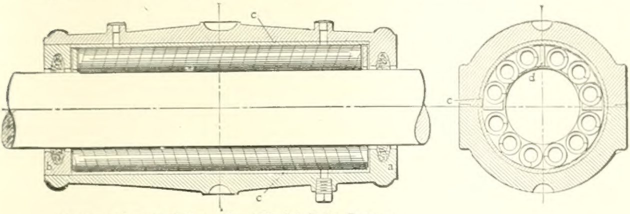
Fire Bricks.
J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town, London, E.

Firewood Machinery.
M. Glover & Co., Patentees and Saw Mill Engineers, Leeds.
Hill and Herbert, Ltd., Great Central Street, Leicester.

PAGE'S WEEKLY Miscellaneous

HYATT ROLLER BEARING CO.

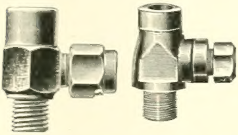
The **HYATT FLEXIBLE ROLLER BEARINGS**, as applied to Shafting and General Power Transmission Machinery, will save **50** to **75** per cent. of the Frictional Load. Efficiency and Durability Guaranteed. Goods sent on approval. Returnable if not satisfactory.



Section of Steel Shaft Box. Hyatt Flexible Roller Bearing.

For new descriptive Book write to

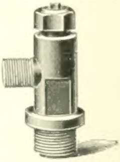
**HYATT ROLLER
BEARING CO.,
47, Victoria St.,
London, S.W.**



The
Scotch & Irish Oxygen Co., Ltd.,
ROSEHILL WORKS, GLASGOW.

Valves for Gas Bottles, Refrigerating Plant, etc., in Bronze, Steel, and Aluminium.

Reducing Valves, Keys, and all Fittings for Compressed Gases



TURNER, ATHERTON & Co. LTD

British Make Throughout.

ELECTRIC HOISTING CRAB,
Driven by "TURNER" Dust-proof Motor.

DENTON. MANCHESTER. ELECTRIC LIFTS

Buyers' Directory—(*Continued*).

Fountain Pens.
Mabie, Todd & Bard, 93, Cheapside, London, E.C.

Forging (Drop) Plants.
Brett's Patent Lifter Co., Ltd., Coventry.

Forgings (Drop).
J. H. Williams & Co., Brooklyn, New York, U.S.A.

Furnaces.
Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.

Gauge Glasses.
J. B. Treasure & Co., Vauxhall Road, Liverpool.
Tomey, J., & Sons, Aston, Birmingham.

Gauges (Pressure, Vacuum, and Hydraulic).
Dobbie, McInnes, Ltd., 45, Bothwell Street, Glasgow.

Gearing.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.
Angus, G. & Co., Ltd., Newcastle-on-Tyne.
Asquith, William, Ltd., Well Road Works, Halifax.
Dixon, W. F., & Co. 60, Percival Street, C. on-M., Manchester.
Reid Gear Co., Linwood, near Glasgow.
Wild, M. B., & Co., Argyle Street, Nechells, Birmingham.

Greases.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Hack Saws.
Baynes, Charles, Knuzden Brook, Blackburn.

Hammers (Steam).
Davis & Primrose, Leith Ironworks, Edinburgh.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Hoisting Machinery.
See Conveying Machinery.

Horizontal Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Bement Pond Co., 23-25, Victoria Street London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Hydraulic Leather.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Hydraulic Machine Tools.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Vauxhall and West Hydraulic Engineering Co. Ltd., 23, College Hill, London, E.C.

Icemaking and Refrigerating Machinery.
H. J. West & Co., 114-118, Southwark Bridge Road, London, S.E.

Indicators.
Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow.
Hannan & Buchanan, 75, Robertson Street, Glasgow.

Iron and Steel.
Allen, Edgar, & Co. Ltd., Imperial Steel Works, Sheffield.
Askham Bros. & Wilson, Ltd., Sheffield.
Buckley, Saml., St. Paul's Square, Birmingham.
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.
Farnley Iron Co., Ltd., Leeds England
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.
Fried. Krupp, Grusonwerk, Magdeburg-Buckau, Germany.
J. Frederick Melling, 14, Park Row, Leeds, England.
Parker Foundry Co., Derby.
Purden, John & Sons, Lambhill Forge, by Maryhill, Glasgow.
Roc Steel Castings Co., Ltd., Temple Bar House, Fleet Street, London, E.C.
Walter Scott, Ltd., Leeds Steel Works, Leeds, England.

Ironwork (Constructional).
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Ironwork (Galvanised).
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Lathes.
Asquith, William, Ltd., Well Road Works, Halifax.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Dean, Smith, and Grace, Ltd., Keighley.
Eclipse Tool Manufacturing Co., Linwood, near Glasgow.
Leckenby, Benton, & Co., Perseverance Ironworks, Halifax.
Mitchell, D., & Co., Ltd., Parsonage Works, Keighley.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross near Halifax.
Swift, George, Clarence Ironworks, Halifax.

Lathe Carriers
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Laundry Machinery
Hill and Herbert, Ltd., Great Central Street, Leicester.
Summerscales, W., & Sons, Ltd., Engineers, Phœnix Foundry Keighley, England

Lifts.
Waygood & Co., Ltd., Falmouth Road London, S.E.

Lubricants.
Blumann & Stern, Ltd., Plough Bridge, Deptford, London S.E.
Reliance Lubricating Oil Co., The, 19 & 20, Water Lane, Great Towe Street, London, E.C.

Machine Tools.
Asquith, William, Ltd., Well Road Works, Halifax.
George Addy & Co., Waverley Works, Sheffield.
Bateman's Machine Tool Co., Hunslet, Leeds.
Beanland, Perkin, & Co., School Close Works, Leeds.
Bertrams, Ltd., St. Katherine's Works, Sciennes, Edinburgh.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Breuer, Schumacher & Co., Ltd., Kalk, near Cologne-on-Rhine (Germany).
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.
Cunliffe & Croom, Ltd., Broughton Ironworks, Manchester.
Dean, Smith & Grace, Ltd., Keighley.
Dempster, Moore & Co., Ltd., 49, Robertson Street, Glasgow.
Fengl, A., & Co., Grafton Street, Altrincham.
Greenwood & Batley, Ltd., Leeds.
Jones & Lamson Machine Co., 97, Queen Victoria Street, London, E.C.
John Lang & Sons, Johnstone, near Glasgow.
Luke & Spencer, Ltd., Broadheath, Manchester.
Jos. C. Nicholson Tool Co., City Rd. Tool Wks., Newcastle-on-Tyne
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.
J. Parkinson & Son, Canal Ironworks, Shipley, Yorkshire.
C. Redman & Sons, Halifax.
Resides, 12, Aire Street, Brighouse, Yorks.
Rice & Co. (Leeds), Ltd., Leeds, England.
G. F. Smith, Ltd., South Parade, Halifax.
Swift, George, Clarence Ironworks, Halifax.
Taylor and Challen, Ltd., Derwent Foundry, Constitution Hill Birmingham
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.
Ward, Haggas and Smith Keighley.
H. W. Ward & Co., Lionel Street, Birmingham
T. W. Ward, Albion Works, Sheffield.
West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.
Winn, Charles, & Co., St. Thomas Works, Birmingham.
Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Machinery Merchants.
Greenwood, Thomas, Waterside, Halifax.

Marks.
Pryor, Edward, & Son, 68, West Street, Sheffield.

Metals.
Delta Metal Co., Ltd., East Greenwich, London, S.E.
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.
Phosphor Bronze Co., Ltd., Southwark, London, S.E.

Metals (Perforated).
Brown, Andrew, & Co., 110, Cannon Street, London, E.C.
Méguin, Fr., & Co., Ltd., Engineering Works, Dillingen-on-Saar.
Staniar, John, & Co., Manchester Wire Works, Manchester

Mining Drill Steel.
Flockton, Tompkin, & Co., Ltd., Newhall Steel Works, Sheffield.

Office Appliances.
Davis John, & Son, Ltd., 30, All Saints' Works, Derby.
Halden & Co., J., 8, Albert Square, Manchester.
Hall & Co., B. J., 39, Victoria Street, London, S.W.
Inglesant, T., & Sons, Ltd., Atlas House, Leicester.
Lyle Co., Ltd., Harrison Street, Gray's Inn Road, London, W.C
Rockwell-Wabash Co. Ltd., 69, Milton Street, London, E.C.
Shannon, Ltd., Ropemaker Street, London, E.C.
Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, London, E.C.

Oils, &c.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London,

Oil Filters and Cabinets.
Valor Co., Ltd., Rocky Lane, Aston Cross Birmingham

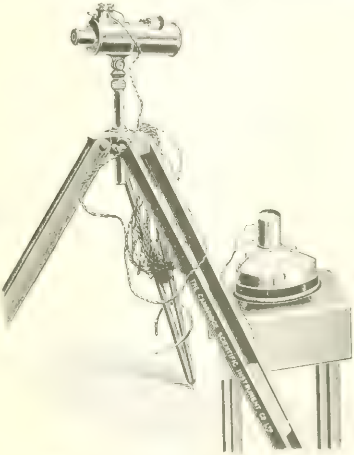
Packing.
Beldam Packing & Rubber Co., 93-94, Gracechurch Street, London E.C.
Lancaster & Tonge, Ltd., Pendleton, Manchester.
Redfern & Co., S., Swan Lane, New Brown Street, Manchester
Quaker City Rubber Co., Coronation House, Lloyd's Avenue, E.C
United States Metallic Packing Co., Ltd., Bradford,

Paper.
Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W

Patent Agent.
Lorrain, J. G., M.I.E.E., M.I.Mech.E., Norfolk House, NorfolkStre Strand, London, W.C.

PAGE'S WEEKLY Miscellaneous

DUST DESTRUCTORS to be effective must be HOT.



The "FÉRY" Radiation Pyrometer

may be used to ensure the control of the Combustion Chamber Temperature.

The Temperature can be read in **20 seconds.**

The Instrument is never in contact with the source of heat, and is therefore indestructible.

Price complete, £26 3s.

Sole Agents for the British Empire, American Continent, the Far East, Scandinavia, etc.

THE CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY, LTD., CAMBRIDGE, ENGLAND.

BROWN & MAY, Ltd.

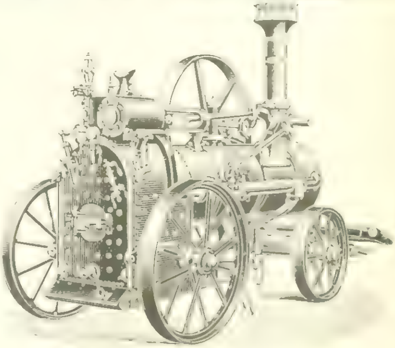
ESTABLISHED FIFTY YEARS.

Our Portable Engines from 2 to 25-h.p. [illegible] absolutely the latest and most improved Engines of their class on the Market, having:—

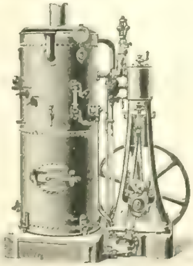
(1.) Cylinder and Crank Shaft Brackets, or W[illegible] Supports.

(2.) Pickering Governors are provided, which are undoubtedly the most sensitive means of regulation obtainable.

(3.) 100 lbs. working pressure.



Makers of Portable, Semi-Portable, Horizontal, Vertical, Undertype, Colonial, and other Steam Engines, Boilers, Centrifugal Pumps, &c., &c.



Makers of

OIL ENGINES.

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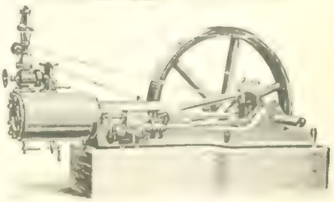


DEVIZES, ENG.

Buyers' Directory—(*Continued*).

Photo Copying Frames.
J. Halden & Co., 8, Albert Square, Manchester.
B. J. Hall & Co., 39, Victoria Street, London, S.W.

Photographic Apparatus.
Marion & Co., Ltd., 22 and 23, Soho Square, London, W.

Pinch Bars.
Samson & Co., Garforth, near Leeds.

Pipe Wrenches (Chain).
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Pistons.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Planished Sheets.
Zeitz & Co., 21, Lime Street, London, E.C.

Pneumatic Tools.
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.

Porcelain.
Gustav Richter, Charlottenburg, near Berlin, Germany

Presses (Hydraulic).
Greenwood & Batley, Albion Works, Leeds
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Publishers.
Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.
King, P. S. & Son, 4, Great Smith Street, Westminster, S.W.
New Zealand Mines Record, Wellington, New Zealand
Spon, E. and F. N., 125, Strand, W.C.

Pulley Blocks.
Kramos Ltd., Locksbrook Engineering Works, Bath.

Pumps and Pumping Machinery.
Drum Engineering Co., 33, Brook Street, Bradford.
Enke, Carl, Schkeuditz-Leipzig, Germany.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
J. P. Hall & Sons, Ltd., Peterborough.
Hathorn, Davey & Co., Ltd., Leeds, England.
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London W.C.

Radial Drilling Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Mitchell, D., & Co. Ltd., Parsonage Works, Keighley.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.
Swift, George, Clarence Ironworks, Halifax.

Rails.
Wm. Firth, Ltd., Leeds.

Railway and Tramway Fastenings.
Bayliss, Jones & Bayliss, Ltd., Monmore Green, Wolverhampton.

Riveted Work.
F. A. Keep, Juxon & Co., Forward Works, Barn Street, Birmingham

Roller Bearings.
Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

Roofs.
D. Anderson & Son, Ltd., Lagan Felt Works, Belfast.
Clayton, Son & Co., Ltd., Hunslet, Leeds.
Head, Wrightson & Co., Ltd., Thornaby-on-Tees.
McTear & Co., Ltd., Newtownards Road, Belfast.
Mellowes & Co., Ltd., Sheffield.

Ropeways (Aerial).
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.
Pohlig, J., Ltd., Cologne, Germany.

Scientific Instruments.
Cambridge Scientific Instrument Co., Ltd., Cambridge.

Shearing and Punching Machines.
Becker, R., & Co., 53, City Road, London, E.C.

Slotting Machines.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Spanners.
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Stampings.
Thomas Smith & Sons of Saltley, Ltd., Birmingham.
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Stamps (Rubber).
Rubber Stamp [illegible] & [illegible] Street Corner, Birmingham.

Stamps (Metal).
Edward Pryor & Son, 48, West Street, Sheffield.

Steam Traps.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Steam Wagons.
Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

Steel Structures.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.
Clayton, Son & Co., Ltd., Hunslet, Leeds.

Steel Tools.
Buckley, Saml. St. Paul's Square, Birmingham.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.

Steel (Tool Steel).
Buckley, Saml., St. Pauls Square, Birmingham.
Flockton, Tompkin & Co., Ltd. Newhall Steel Works, Sheffield.

Stokers.
Ed. Bennis & Co., Ltd., Bolton, Lancs.

Stone Breakers.
S. Pegg & Son, Alexander Street, Leicester.

Superheaters.
A. Bolton & Co., [illegible], Deansgate, Manchester

Testing Machines.
Denison, Saml., & Son, Ltd., Hunslet Moor, near Leeds.

Time Recorders.
Howard Bros., 40, Paradise Street, Liverpool, and [illegible], Queen Victoria Street, London, E.C.

Tubes.
Thomas Piggott & Co., Ltd., Spring Hill, Birmingham
Tubes, Ltd., Birmingham.

Turbines.
Greenwood & Batley, Albion Works, Leeds.
S. Howes Co., 64, Mark Lane, London, E.C.

Typewriters.
Empire Typewriter Co., 77, Queen Victoria Street, London, E.C.
Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

Valves.
Holmes & Co., W. C., Huddersfield.
Hopkinson, J. & Co., Ltd., Britannia Works, Huddersfield.
Hunt & Mitton, Crown Brass Works, Oozells Street North, Birmingham.
Scotch and Irish Oxygen Co., Ltd., Rosehill Works, Glasgow.
Shaw, Joseph, Albert Works, Huddersfield.
Winn, Charles, & Co., St. Thomas Works, Birmingham.

Ventilating Appliances.
Matthews & Yates, Ltd., Swinton, Manchester

Water Softeners and Purifiers.
Lassen & Hjort, 52, Queen Victoria Street, London, E.C.

Wagons—Steam.
Thornycroft & Co., J. I., Ltd., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

Weighing Apparatus.
W. & T. Avery, Ltd., Soho Foundry, Birmingham, England.
Denison, Saml., & Son, Ltd., Hunslet Moor, near Leeds.

Wells Light.
A. C. Wells & Co., 100A, Midland Road, St. Pancras, London, N.W.

Wire Ropes.
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

Wire Working Machinery.
Ed. Brand, 35, Shakespeare Street, Manchester.

"Woodite."
"Woodite" Company, Mitcham, Surrey.

PAGE'S WEEKLY Miscellaneous

[illegible]
"THOM, PATRICROFT."

Telephone: No. 60 Eccles.

Contractor to H.M. Government

Canal Works.

Patricroft, March 30th. 1906.

Dear Sirs

Why pay 6^d^ to 1/8 per 1000 gallons for water when you can pump it for less than 1¼^d^ from an Artesian Well on your own premises?

Let me know the amount of water you require and I shall be pleased to quote.

Yours faithfully

John Z Thom

To Messrs. Page's Weekly Readers
Everywhere.

"VALOR" PATENT WASTE OIL FILTER

BEST AND MOST EFFECTIVE IN THE UNITED KINGDOM

For thoroughly cleansing dirty oil so that it can be re-used.

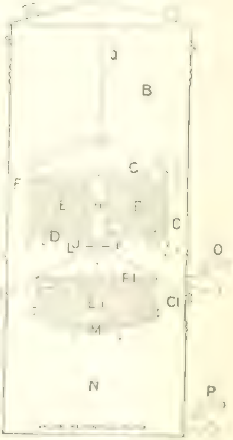
NO CHANCE FOR ARGUMENT TO YOUR PROFIT AND ADVANTAGE

It saves your oil. It saves your money.
WHAT MORE DO YOU WANT?

Use the "Valor" Patent Oil Filter which will Repay its Initial Cost in a few weeks.

Cases Free and Carriage Paid to any Railway Station in England and Wales.

No.	To Filter [illegible] Approx. Gallons.	Capacity. Gallons Filtered Oil.	Dirty Oil.	[illegible]	Dia. Inches	Price.
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	39
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	46 6
3	[illegible]	[illegible]	[illegible]	[illegible]	12	60/
4	12 to 24	[illegible]	[illegible]	[illegible]	[illegible]	75
5	[illegible]	[illegible]	[illegible]	[illegible]	18	100 -
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	120



PLEASE ADDRESS IN FULL

THE VALOR COMPANY, Ltd., Oil Filter Works ASTON CROSS **BIRMINGHAM.**

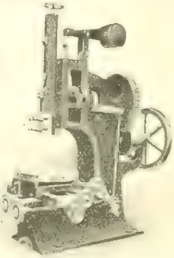
PAGE'S WEEKLY Machine Tools

Illustration shows Hydraulic Flanging Press (Progressive Type), for Flanging Boiler Plates, etc.

RICE & CO. (Leeds), LIMITED,
LEEDS,
ENGLAND.

HYDRAULIC
Riveters, Presses, Cranes, Punches, Shears, Hoists,
Lifts, Pumps, Accumulators, Intensifiers, Valves, &c., &c.

A B C Code, 4th Edition, used.
Telegraphic Address: "Press, Leeds."
Telephone No. 282



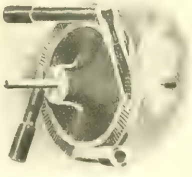
SLOTTING MACHINES

Every Machine accurately made and well finished.

All kinds of
MACHINE TOOLS
Special and General

Write for particulars and prices to

G. F. SMITH, Ltd.,
South Parade, HALIFAX.
Telegrams: "RADIAL, HALIFAX."

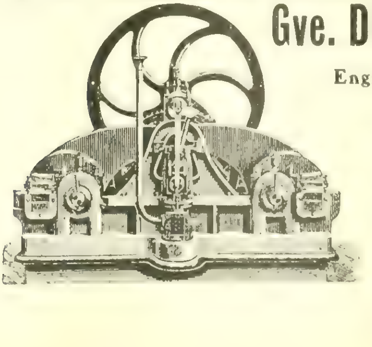


GREENWOOD & BATLEY, Ld.
LEEDS.

Machine Tools.

Dynamos & Motors.

De Laval's Patent Steam Turbines.



Gve. DETOMBAY, Mce. DELANGE & Cie.
Engineering Works, HOBOKEN, near ANTWERP.

SPECIALITIES: APPLIANCES FOR PUBLIC WORKS:—Dredgers. — Elevators. — Excavators. — Tugs. — Centrifugal Pumps.—Sand Pumps.—Ballast Barges.—Lighters.—Yachts.—Hand, Steam and Hydraulic Cranes.—Drawbridges.—Pontoons.—Derricks.—Hand and Steam Winches.—Steam Engines.—Traction Engines.—Plant for Blast Furnaces.—Steel Works, Rolling Mills.—Gasholders.—Steam Hammers.—Shearing and Plate-edge Planing Machinery, &c.

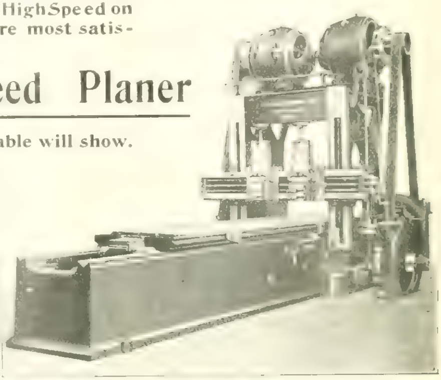
PAGE'S WEEKLY Machine Tools

MODERN PLANING

Modern requirements can only be met by a tool with Variable Speeds on the Cut and Constant High Speed on the Return. These necessary features are most satisfactorily realised in the

Bateman Patent High-Speed Planer

as an inspection of the following Speed Table will show.



42 in X 42 in. X 12 ft **PATENT HIGH-SPEED PLANER** [illegible]

Size of Planer.			Length of stroke.		Time of 10 cycles of cut and return.		Feet travelled. Stroke × 2 × 10.	Average Speed. Feet per minute.	Maximum Speeds. Feet per minute.		Mean Speed. Feet per minute.	
[illegible]	[illegible]	ft.	ft.	in.	m.	sec.			cut	retn.	cut	retn.
[illegible]	24	[illegible]	[illegible]	[illegible]	1	[illegible]	126	111	80	[illegible]	78	[illegible]
[illegible]	[illegible]	[illegible]	20	3	10	[illegible]	405	40	[illegible]	[illegible]	23	150
[illegible] speed			20	3	[illegible]	14	405	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] for			[illegible]	[illegible]	4	46	405	85	61	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	12	[illegible]	[illegible]	2	[illegible]	[illegible]	84			[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	22	[illegible]	6	39	[illegible]	68	45	145	44	[illegible]
[illegible]	[illegible]	12	13		4	8	[illegible]	63	42½	140	42	127

[illegible]

Time your planers and compare with the above speeds. Then calculate what you lose yearly by using old fashioned tools, and write to us for our Catalogue.

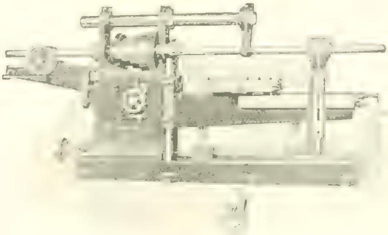
Address—

B. H., BATEMAN'S MACHINE TOOL CO., LTD., Balm Road, LEEDS, ENG.

POWERFUL, DURABLE, ACCURATE.

These are essential qualifications in machines of the type illustrated. Our make complies with these requirements, and in addition embodies all the most advanced time and labour saving features.

COMBINED HORIZONTAL DRILLING, BORING, FACING, AND MILLING MACHINES . . .



Large range of speeds and feeds.
Tables self-acting in all traverses.
Strong and rigid for high speeds.
Cover a very large range, and various classes of work.

Send for descriptive Booklet, BI.

CONTRACTORS to the ADMIRALTY, WAR OFFICE, Etc.

WILLIAM ASQUITH, LTD.,

SPECIALISTS in HIGH SPEED DRILLING and BORING MACHINES.

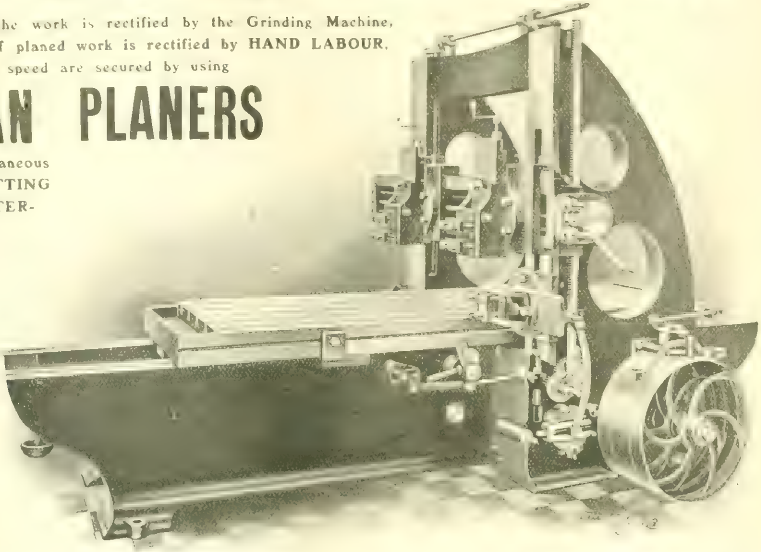
Well Road Works, HALIFAX, England.

PAGE'S WEEKLY **Machine Tools**

Inaccuracy of lathe work is rectified by the Grinding Machine, and inaccuracy of planed work is rectified by **HAND LABOUR**, but accuracy and speed are secured by using

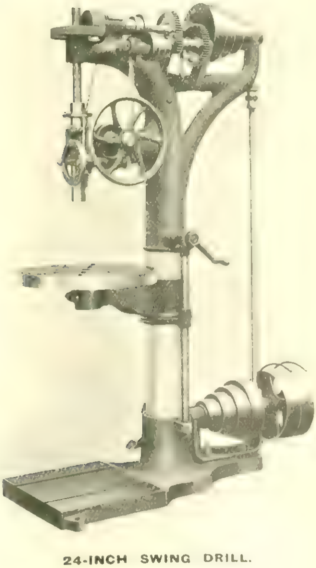
REDMAN PLANERS

with their instantaneous change **FOUR CUTTING SPEED COUNTER-SHAFTS.**



Ask specially for Planing Machine Catalogue.

C. REDMAN & SONS, Dunkirk, Halifax, ENGLAND.



24-INCH SWING DRILL.

Cunliffe & Croom, Ltd.,

Broughton Lane,
MANCHESTER,
ENGLAND.

SHOWROOMS:
66, Victoria St.,
Manchester.

UPRIGHT DRILLING MACHINES.

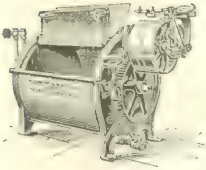
Made in Two Sizes.

20 & 24 inch.

SPECIFICATION.

Drills from the solid	1¼ in.	1½ in.
Diameter of spindle	1⅜ in.	1⅝ in.
Distance spindle to baseplate ...	3 ft. 6 in.	4 ft.
Vertical adjustment of spindle ...	8 in.	8 in.
Diameter of table	16½ in.	19 in.
Approximate weight	6½ cwt.	10 cwt

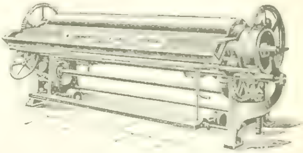
PRICES ON APPLICATION.



LAUNDRY

MACHINERY

and Steam COOKING APPARATUS.



Please write for our New Catalogue, **N.**

Summerscales, Ltd., KEIGHLEY, ENGLAND.

Dean, Smith, & Grace, LTD.,

Lathe Manufacturers.

Established 1865.

KEIGHLEY.

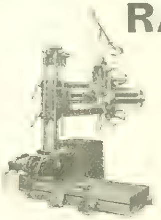
WRITE FOR CATALOGUE.

See Our Advertisement next Week.

HIGH-CLASS LATHES

AND

RADIAL DRILLS.



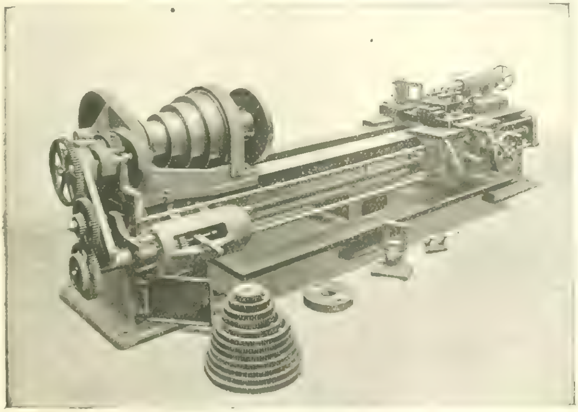
Write for our Lists

D. MITCHELL & CO., Ltd.

Parsonage Works, KEIGHLEY.

[illegible]

On War Office and India Office Lists



WE MAKE
HIGH-SPEED
LATHES

A Speciality.

"ACCURATE."
"DURABLE."
"POWERFUL."

8½ in., 10 in., and 12 in. Centres.

REASONABLE IN PRICE.

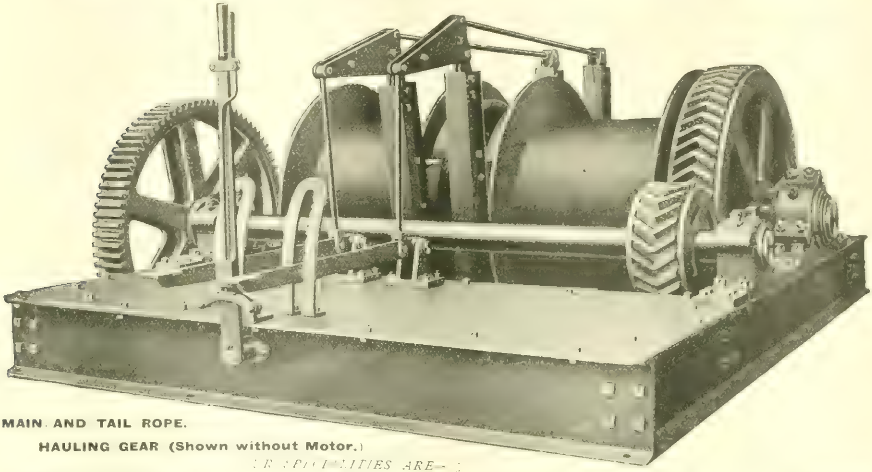
UNEQUALLED IN POWER.

Send us your Enquiries.

NOBLE & LUND, LIMITED,
FELLING-ON-TYNE.

PAGE'S WEEKLY Gears, &c.

Electric Hoisting and Hauling Gears.



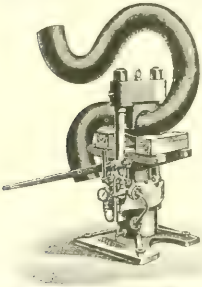
MAIN AND TAIL ROPE.
HAULING GEAR (Shown without Motor.)

OUR SPECIALITIES ARE—

Telephone: No. 208 Aston.
Telegrams: "Hauling, Birmingham."

Haulage and **Hoisting** for all purposes; also **Pumping**

M. B. WILD & CO., ARGYLE STREET, NECHELLS, **BIRMINGHAM.**



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Pipe Bending Machines

For Pipes up to 14 in. diameter.

R. BECKER & Co.

53, CITY ROAD, E.C.

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CRUSHING and MINING MACHINERY.

Stone Breakers, Stamp Batteries,
Roller Mills, Edge Runners, Ball Mills,
TUBE MILLS,
Amalgamating, Concentrating and Leaching Plant.
Large Testing Station at the Works.

Sole Representative for Great Britain and Ireland: **W. STAMM.** 25, College Hill, Cannon Street, LONDON, E.C.

PAGE'S WEEKLY Steelwork, &c.

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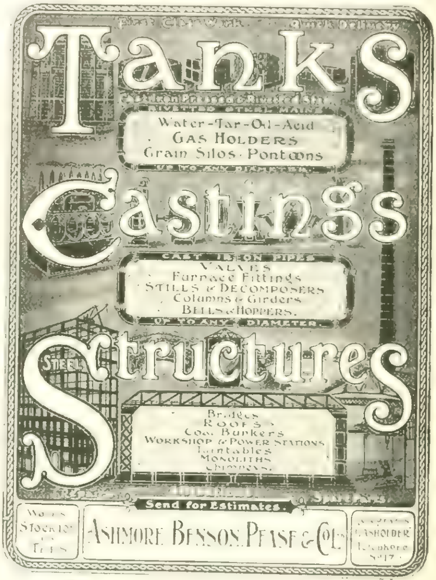
HUNSLET, LEEDS,
MAKERS OF THE
LARGEST STEEL TANK
AND THE
LARGEST GASHOLDER IN THE WORLD.

ROOFING,
CONSTRUCTURAL
STEEL WORK,
PETROLEUM TANKS.

Wires.— "Gas, Leeds."
London Office:— 60, Queen Victoria Street.



First Class Work. Quick Delivery.

Tanks

Cast Iron Pressed or Rivetted Steel
RIVETTED STEEL MAINS
Water-Tar-Oil-Acid
GAS HOLDERS
Grain Silos · Pontoons
UP TO ANY DIAMETER.

Castings

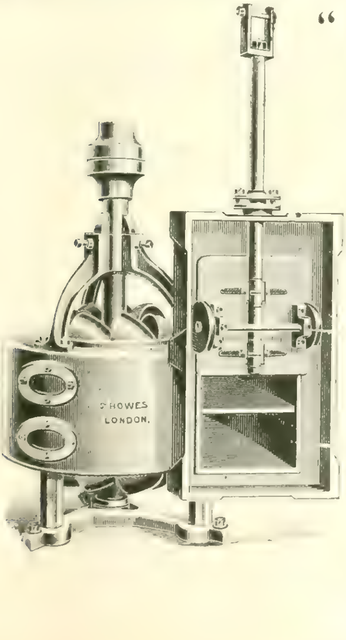
CAST IRON PIPES
VALVES
Furnace Fittings
STILLS & DECOMPOSERS
Columns & Girders
BELLS & HOPPERS.
UP TO ANY DIAMETER.

Steel Structures

Bridges
ROOFS
Coal Bunkers
WORKSHOP & POWER STATIONS
Turntables
MONOLITHS
Chimneys.

Send for Estimates.

Works Stockton-on-Tees
ASHMORE BENSON, PEASE & Co. Ltd.
Largest Gasholder Telephone No 17.



"Little Giant" Turbines, Pelton Wheels & Water Motors.

CHEAPEST TO ERECT, FIX, AND MAINTAIN.
FEWEST WORKING PARTS OF ANY TURBINES.

CATALOGUE FREE UPON APPLICATION

THE S. HOWES CO.,

Manufacturers of Special Machines for Flour, Stamp, Corn and Cereal Mills.

Coffee and Rice Plantation and Milling Machinery.

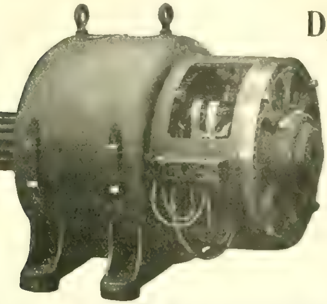
Saw-Dust, Bark, Cement, and Plaster Packers.

Over Fifty Years' Experience. Government Contractors.

Telegrams, "BARBEAU, LONDON." Telephone 1924 Avenue.

64, MARK LANE, LONDON England.

PAGE'S WEEKLY Miscellaneous



Dynamos
AND
Motors
for all purposes.

NEWTON BROS., DERBY.

TEMPERLEY TRANSPORTERS

For Rapid and Economical Handling of General Cargo, Coal, Ore, &c.

See our Advertisement in March 10th issue.

TEMPERLEY TRANSPORTER CO.,
72, Bishopsgate Street Within,
LONDON, E.C.

Telephone: 305 London Wall. Telegrams "Transumo."

For the information of Readers and Subscribers, we beg to announce that

Page's Weekly

is published half-yearly, in two volumes, as follows:

(1) From the first week in January to the last week in June.

(2) From the first week in July to the last week in December inclusive.

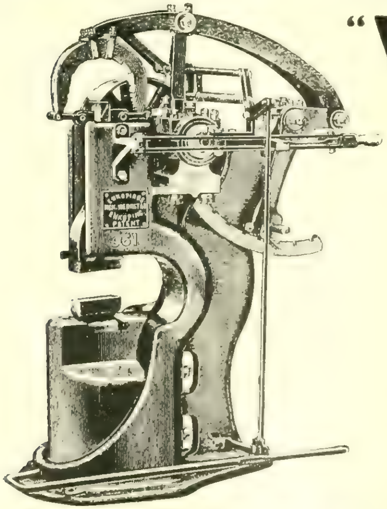
BOUND VOLUMES.

PRICES.

	s.	d.
Half Morocco	20	0
Green Cloth	15	0

Clun House, Surrey Street,
Strand, London, W.C.

THE..



"VULKANUS"

Spring Power Hammer.

The most practical, easily managed, adaptable, and durable spring power hammer in existence.

The "Vulcanus" forges fast and well.

It can be used both for heavy and small forgings.

It is very suitable for welding.

It is easy to erect and easy to manage.

Takes up but little room.

Great striking-power in connection with little motive power.

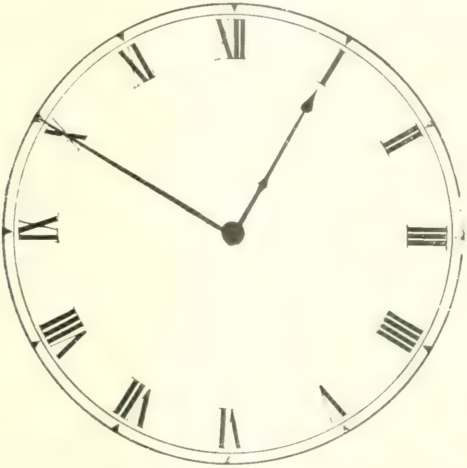
HUNDREDS IN USE.

Aktiebolaget B. A. HJORTH & Co., STOCKHOLM,
Sweden.

PAGE'S WEEKLY Time Recorders

IT IS

TEN TO ONE !!!



If you write for a Descriptive Booklet and Price List of

The "Dey" Time Register

To HOWARD BROS.,

The Proprietors,

100b, Queen Victoria Street, London, E.C.,
Or, Head Office, **40, Paradise Street, Liverpool,**

AND LOOK INTO THE QUESTION of Time and Cost Keeping, you will find you are **LOSING MONEY** where you could **SAVE** it by using the **"DEY" TIME REGISTER.**

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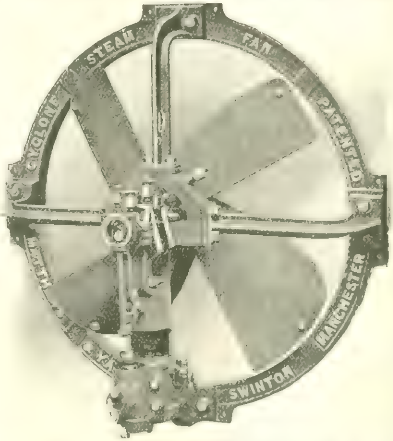

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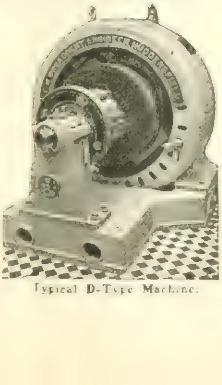

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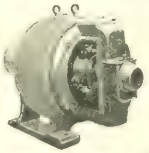

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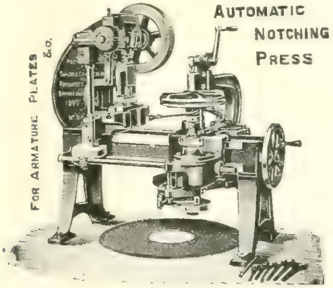

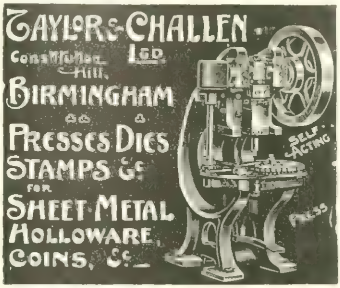

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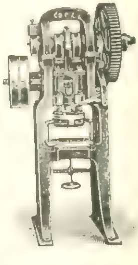

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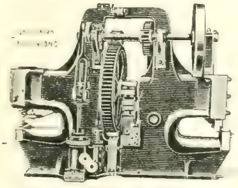

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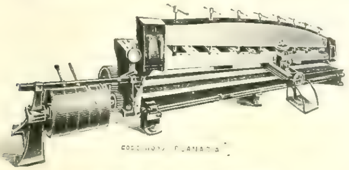

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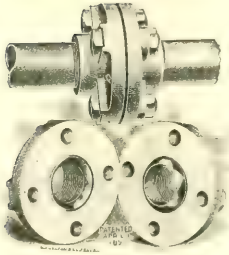

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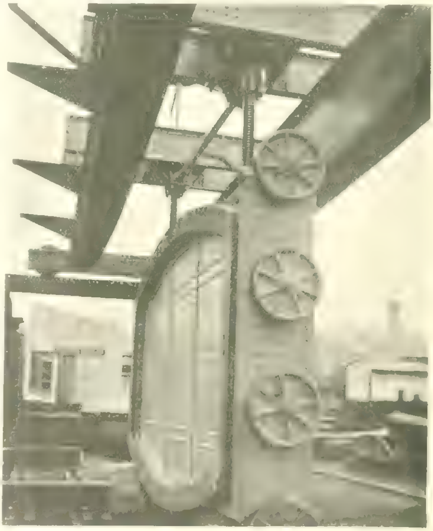
DAVIDGE PAGE, F.C.S., F.G.S., M.I.M.E., Editor.

VOL. VIII. LONDON, FRIDAY, MARCH 30, 1906. No. 81.

THE OFFICES OF "PAGE'S WEEKLY,"
Wednesday evening.

A FACT that will be more and more recognised during the sittings of the new Royal Commission on Canals, is that this question is intimately bound up with that of Water Conservancy, or (to quote a well-known definition) "the scientific treatment and regulation of all the water received in these islands from its first arrival in the form of dew or rain till its final disappearance in the ocean." Attention may, therefore, be fitly called to a volume which has just made its appearance dealing with the canal question as a branch of water conservancy, by Urquhart A. Forbes and W. H. R. Ashford. It is true that the work is, what is professes to be—a history—but with commendable foresight the authors have added a chapter on the resuscitation of our waterways. They discuss the gradual revival of interest in the subject which commenced a little over a quarter of a century ago, and grow regretful when they record the withdrawal of the Canals Trust Bill of 1905, its promoters having neglected to comply with the regulation requiring Bills of this description to be advertised in the London Gazette.

We are reminded that this Bill proposed to incorporate a body analogous to the London Water Board, comprising twenty-nine trustees, who were to be empowered to purchase on terms to be agreed upon or determined by arbitration, the Birmingham, Coventry, Grand Junction, Leeds and Liverpool, Trent and Mersey, Oxford, Warwick and Birmingham, Warwick and Napton, Staffordshire and Worcestershire, Worcestershire and Birmingham, Droitwich and Droitwich Junction Canals, the Berkeley Ship Canal, and the Kennet and the Avon and the Trent Navigations. The acquisition of these fifteen waterways, which in 1868 had a total [illegible] 168,767, and a total capital of £7,669,593, would have enabled the Trust to organise a system of through communication between London, Liverpool, Hull, and Bristol. The Trust were to be empowered to



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borrow money for carrying out the Act, and the tolls were to be regulated by a Provisional Order of the Board of Trade. Unfortunately, Parliament never had an opportunity of passing an opinion upon the scheme.

As to the principles to be observed in carrying out the resuscitation of our inland waterways, the authors point out that they have been clearly indicated in a memorandum on the Policy of Water Carriage presented to the Select Committee on Canals, 1883, by General Rundall. This authority grouped the various measures necessary for the purpose under the following three heads:—(1) Improvement in construction, under which he includes uniformity of gauge in canals and locks and their adaptation to steam haulage; improvements in the construction of canal boats and facilities for loading and unloading at important industrial centres; (2) Amelioration of administration, under which he includes the regulation of tolls, the establishment and maintenance of through rates and the formation of a systematic service of boats; (3) Controlling supervision, under which he includes the questions of amalgamation, or control by central authority. The authors lay stress upon the importance of the gauge question, pointing out that until this is determined it is obviously impossible to decide that of the probable expenditure on construction necessary to render canals fit to compete with railways, which was estimated by the late Mr. Abernethy at £12,000, but by the late Mr. Conder and General Rundall at only £5,000 to £6,000 a mile.

Certain improvements could, of course, be made by the canal companies themselves, but the authors of the work in question* are soon brought face to face, like every other inquirer into our canal systems, with the need for some controlling authority. Thus we read: "The settlement of all these questions of improvement of construction and amelioration of administration is, however, manifestly dependent on that of the fundamental one of controlling supervision, which forms the last head of General Rundall's memorandum; and it may be pointed out that the first step towards a solution of this problem must be the appointment of a commission of experts to survey the waterways of the United Kingdom in order to ascertain which of them, and especially with regard to through routes, would best repay their maintenance and development; to determine a minimum standard of dimensions for these; and to fix a uniform maximum scale of freight charges for traffic carried upon them."

When this paragraph was penned the authors probably had little hope that a commission covering this very ground would so soon be appointed, and at work under Lord Shuttleworth. The commission will view the question in all its aspects—engineering, financial, commercial, legislative, and it is a thoroughly representative body, including Lord Kenyon, Lord Brassey, Lord Farrer, Sir John Dorington, Sir John Brunner, M.P., Sir F. Hopwood (Permanent Secretary to the Board of Trade), Mr. W. T. Crossley, M.P., Mr. R. Rea, M.P., Mr. J. F. Remnant, M.P., Mr. P. Snowden, M.P., Mr. Henry Vivian, M.P., Mr. L. A. Waldron, M.P., Mr. R. H. Davidson, C.E., Mr. J. P. Griffiths, C.E., Dr. J. Herbertson, Mr. J. P. E. Inglis, Mr. H. S. Killick, and Mr. John Wilson. The Secretary is Mr. W. B. Duffield, barrister-at-law. It was mentioned at a recent sitting that the Commissioners will visit Ireland in the autumn of the present year. The evidence hitherto given has perhaps been more interesting from an antiquarian than an engineering point of view.

Owing to the temporary indisposition of Lord Shuttleworth, chairman of this Commission, the meeting arranged for the 28th inst. at the Royal Commission House, Old Palace Yard, has been postponed until April 4th, when the evidence of Mr. Jackson, Assessor of Railways and Canals in Scotland, the Hon. Edward Gully, C.B., secretary to the Caledonian Canal Commissioners, and Mr. Arthur Lee, of the Associated Chamber of Commerce, will be taken.

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* Our Waterways. 12s. net. John Murray.

The London County Council Electric Supply Bill came up for second reading in the House of Commons on Tuesday last. It was suggested in the course of the debate that the electric supply business was of a highly speculative character, that at present nobody knew whether even in the hands of a company it would prove a profitable undertaking, and it was improper that the London County Council should incur such a heavy liability on behalf of the ratepayers. It was further urged that to push a business of this kind required all the qualities necessary for running a great commercial undertaking, and it was much to be doubted whether such qualities as these could be exercised, or were even possessed by a municipal authority. It was delicately hinted that certainly the London County Council had given no evidence of possessing such qualities. Friends of the Council, on the other hand, urged that a public authority had many advantages over a company, and that the Council was in a unique position to deal with the matter of electric supply. The suggestion that the County Council bill was a wrecking bill was repudiated with infinite scorn. Other speakers championed the view that the London County Council with this bill was seeking to throttle private enterprise, and pursuing a policy that would cast upon the already overburdened ratepayers the risks involved in a large further expenditure of capital. Mr. Lloyd George intimated, however, that the Government proposed to support the second reading of the bill, and to move that it be referred to a hybrid committee with a *locus standi* to all those who had petitioned against the bill, including all the private enterprises which had been referred to. They proposed to instruct the committee to consider with special reference to this bill the best means of providing for a supply of electric energy in bulk, and for power and motive purposes, and to report thereon. That instruction would give very full powers to the committee to consider all the points that had been raised.

This was probably the easiest way out for the Government, and it happens at the same time to have given something approaching satisfaction to the interests involved. The promoters of the old Administrative County of London scheme in getting the County Council bill referred to a hybrid committee, and the other bills suspended, no doubt accomplished as much as they had hoped. What dissatisfaction does exist has found expression from Mr. Stanley Boulter, chairman of the company which is promoting the Additional Electric Power Supply Bill, who complains that while the London County Council bill was given a second reading, those interested in the other bills only obtained power to appear and make objections to the London County Council bill. An opinion appears to prevail in some quarters that an amalgamation of interests may possibly be brought about between the Administrative County of London Company and the London County Council, in regard to the matter of electric supply within the Metropolitan area. If that were done, it should be noted that those behind the Additional Electric Power Supply Bill are willing to omit from their bill the clauses which relate to the supply of current in bulk except to railways, tramways and canals. The primary part of this scheme, as Mr. Boulter points out, is the railway portion, and the large railway companies have, he claims, a desire to see the bill become law this session, being prepared to take advantage of the facilities offered as soon as possible. Mr. Boulter adds, with a touch of irony, that it surely cannot be in the interests of the great body of Londoners, that a scheme for solving the problem of cheap and speedy locomotion in the Metropolitan area should be wrecked and abandoned in order to soothe the susceptibilities of the London County Council. Perish the thought!

Universal Penny Postage very properly claimed a large share of attention at the annual conference of the National Chamber of Trade at Watford last week, and, we are inclined to think, that if there were a few more enthusiasts of Mr. Henniker Heaton's stamp, this much-needed reform would soon be realised. This authority ridiculed the idea of 2½d. being charged for a letter delivered in the United States whereas, under the system of Imperial penny postage, letters were conveyed through the

United States to Canada for the sum of 1d. Again in regard to the cost of postage between Dover and Calais, it was unreasonable that the charge should be 2½d., when every Friday they sent a quarter of a million letters from Dover to Calais *en route* for all British possessions. The officials of the Post Office were the people they had to fight against. In France, Germany and Italy, combinations of leading men had been formed to inquire into the matter. He started out on a little tour the other day, and succeeded in converting Egypt. He understood privately that the Japanese Government had stated that they were willing to accord a similar reduction to every country in the world. Egypt was followed by New Zealand in giving penny postage to the world.

He had received a letter from the Postmaster-General of France expressing his greatest possible sympathy with the proposal, at the same time stating that no overtures had yet reached him on the part of the British Government. The King himself was engaged in the great task of creating peace and goodwill amongst the nations, and the people could not do better than help him in that noble task by urging the immediate establishment of universal penny postage.

There was a strong reason to believe that France would agree to a restricted postal union between England and France, and he believed that all the other nations would then come in. A profit of £5,000,000 a year was made by the Post Office, the increase last year being £400,000, and what he asked the Government to do was to give a quarter of that profit—£100,000—to the object which he had in view. The establishment of penny postage throughout the world would sow the seed for a harvest of trade and good feeling such as the world had never known. To-day we had universal half-penny postage for printed matter up to 2 oz. in weight, and why could not penny postage for half an ounce of written matter, to travel in the same bag and in the same direction, be allowed?" Why not, indeed?

At this meeting it was agreed, on the motion of Mr. Louis Sinclair, that "this conference urges the Government at an early date to appoint a Ministry of Commerce with, at its head, a Minister of First Cabinet rank, and that the Chambers of Trade and Commerce shall be given an effective advisory status in connection with the reorganisation of a Commercial Department." A resolution was also passed in favour of a concession for closed letters, at a halfpenny rate for local delivery only. This resolution, together with the recent pronouncement in favour of cheaper local telegrams, may be taken as an indication that the Post Office is shortly going to have an extended career of usefulness.

A writer in the World's Work and Play gives advance details of the exhibition to be opened at Milan in April. The principal portion of the Exhibition, he says, will be at the Piazza d'Armi (hitherto used by the garrison), on the outskirts of the town, and the remainder in the public park, with which it will be connected by an electric railway. The total area occupied will be about 840,000 square metres, 201,300 square metres of which will be covered by buildings. In the transportation section—land, sea and river—retrospective exhibits will show the historical development of the various methods of travel, and here—perhaps here alone—Great Britain will be well represented. The British Government gave a grant of £10,000, and an influential committee worked from London on behalf of British representation, but it is to be feared that the average British firm is just a little tired of exhibitions—or it may only be that it does not regard Italy as likely to afford the best return for its money. Japan Germany, France, Mexico, Belgium, Switzerland, Austria, Great Britain, and Italy will be officially represented at the exhibition; and nearly every other country in the world, including China, and the most active of the South American nations, will be largely represented as to their trades and evidences of their progress in every field. Among foreign nations France will be most largely represented. The German Government will exhibit in the naval, railway, and post office divisions. Russia, Spain, Portugal, and the United States are all participating, and some of the chief capitals of Europe—Paris, Vienna, Berlin, Budapest—are erecting pavilions at their own expense to exhibit their municipal public services. The dominant feature will be motion.

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Personal Pars.

[illegible] M.I.E.E., [illegible] Armstrong College, Newcastle, to the newly created Professorship [illegible] College. The new Professor has been head of the electrical engineering department of the Armstrong College for over seven years. He studied at the University College, Liverpool, from 1892 to 1896 under Professor (now Sir) Oliver Lodge, and on leaving college he was for two years senior lecturer in engineering at University College, Bristol. He is Chairman of the Newcastle Section of the Institution of Electrical Engineers, and has published [illegible] electrical subjects.

MR. W. C. ACFIELD, formerly signal superintendent of the London, Brighton and South Coast Railway Company, has been presented by his late confreres with a handsome testimonial. Mr. H. S. Starnes, in making the presentation, said that when they heard that Mr. Acfield had obtained the post of chief signal engineer to the Midland Company, they all felt that they could not let him leave without [illegible] of regard. Several of the district traffic superintendents, etc., also expressed a wish to contribute, so it was decided to present a massive inkstand from the employees and a pair of candlesticks (all of solid silver, suitably engraved) from [illegible].

MR. [illegible] THOMAS, [illegible] Railway [illegible] Manchester. Mr. [illegible] Western Railway [illegible].

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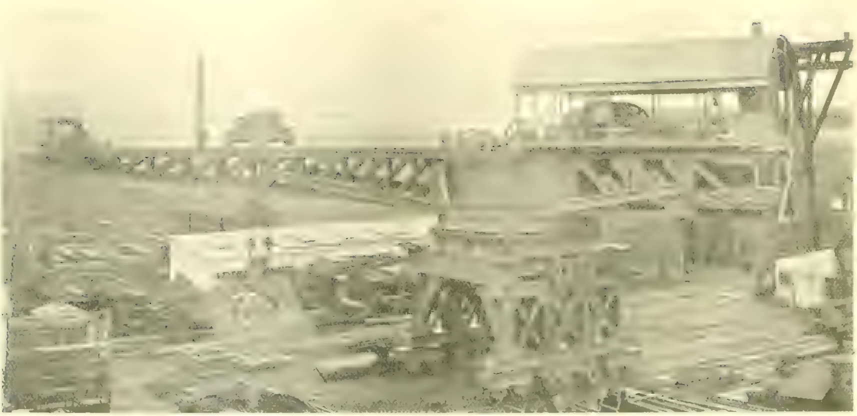


33-TON STEAM CRANE, CONSTRUCTED FOR THE MADRAS HARBOUR BOARD BY MESSRS. STOTHERT AND PITT, LTD., BATH. (See page 710.)

Islington Motor Show.

In spite of the fact that many of the leading manufacturers of the motor industry are under engagement not to exhibit at any show not held under the auspices of the Society of Motor Manufaiturers and Traders, Mr. Charles Cordingley is to be congratulated on having brought together a collection of representative exhibits. In the department devoted to heavy vehicles the exhibits are of excellent class, and notable stands are those devoted to the Critchley-Norris omnibus, driven by a 4-cylinder Crossley motor, Beyer-Peacock and Co., Alley and Maclellan, Carter's Steam Wagon Co., and Bretherton and Bryan, who show new wagon types. Among other firms exhibiting at the Exhibition are Messrs. Beardmore and Co., the Scotch Steel Makers, the Thames Engineering Works, the Herald Motor Co., and the Newmobile Co. The motor boat department is not so representative, but the display is interesting enough, and a good deal of interest has been manifested in the demonstrations given of Cochrane's Corrugated Oscillating propeller.

The outstanding lesson to be learned from the success of the Exhibition is that the attempt on the part of the Automobile Club and the Society of Motor Manufacturers and Traders to create a monopoly in motor shows in the London district has absolutely failed. As other writers have pointed out, circumstances have been too strong for such a policy to be successful. The astonishing development of the industry in this country, and the impossibility of finding space at Olympia or elsewhere for all the firms who wish to exhibit, has made it quite possible to hold independent exhibitions. It is not unlikely that the Society of Motor Manufacturers and Traders will recognise, not that they have made a mistake, for the policy initiated was sound enough at the time, but that the moment is opportune for the reconsideration of the whole question.

World's Largest Ships.

In view of the paragraphs which have recently appeared on the subject of the largest steamers in the world, the Marine Review gives the following table, showing the dimensions of the world's ten largest ships either in course of construction or already running:—

Name of Steamer.	Gross tonnage.	Length over all. Feet.	Breadth over all. Feet.	Depth m'ld. Feet.
*Mauretania ...	[illegible]	[illegible]	88	60
*Lusitania	[illegible]	[illegible]	88	60
‡Kaiserin Auguste Victoria	[illegible]	[illegible]	77½	54
†Adriatic	[illegible]	[illegible]	75½	49
†Baltic	[illegible]	[illegible]	75½	49
†Amerika	[illegible]	[illegible]	74½	53
†Cedric	[illegible]	[illegible]	75¼	49
†Celtic	[illegible]	[illegible]	75¼	49
*Caronia ...	[illegible]	[illegible]	72½	43½
*Carmania	[illegible]	[illegible]	72½	43½

* Cunard. † White Star. ‡ Hamburg-American.

All the vessels named have twin screws and reciprocating machinery except the Cunard liners Mauretania, Lusitania and Carmania, which are turbines. The Carmania has triple screws, and the two other Cunarders named—which are those being constructed under the company's contract with the British Government—will have four screws.

MESSRS. JOHNSON AND PHILLIPS, LTD., Old Charlton, Kent, have been elected members of the Cable Makers' Association, and their standard wires will in future bear the official labels authorised by that Association.

SUPERINTENDENT E. SMITH, of the Devonport Dockyard Police, retires this week after 41 years' connection with the force, most of which has been spent in the Dockyard Divisions.

Naval Notes.

Most enthusiastic has been the welcome bestowed by Londoners upon the 32 officers and 582 men of the Japanese Navy who arrived in the Thames on Saturday to man the two new battleships, *Katori* and *Kashima*. It was arranged that after seeing some of the sights of the metropolis, fifteen officers of the first and second classes and 270 men, under the command of Commander C. Kawansi, should leave London by special train for Barrow-in-Furness, there reporting themselves to Captain Ijichi, who is superintending the finishing details of the battleship *Katori*, and afterwards going on board that vessel to prepare for carrying out the steam and gunnery trials. The remainder of the officers and men, under Commander H. Yootrika, proceed to Newcastle in the *Iyo Maru*, to join the battleship *Kashima*. The *Katori* is announced to leave Barrow-in-Furness on April 12th for the Mersey, where she will be docked at Birkenhead for cleansing before speed trials. The Japanese Consul has arranged for a banquet to be held on April 18th, at which a distinguished company will be entertained.

The six new French cruisers which are to be laid down this year will, according to the Temps, have a displacement of 18,000 tons. Their length will be 145 mètres (578 ft.), their beam 25·65 mètres (84 ft.), and their maximum draught 8·44 mètres (28 ft.). The engines are to be of 22,500 h.p., giving a speed of 19 knots. The radius of activity with a normal supply of coal will be 4,000 miles at ten knots, or 925 miles at the maximum rate of speed, while with the extra supply which it will be possible to carry these distances will be 8,500 miles and 1,900 miles respectively. The armament will consist of four guns of ·305 millimètres (12 in.), 12 of 240 (9½ in.), 16 of 75 (3 in.), and eight of 47 (1¾ in.). It will further include two under-water discharge tubes for torpedoes. The complement will comprise 31 officers and 690 men. The cruisers are to be finished in four years.

The cruiser *Almirante Grau*, built at Barrow, for the Peruvian Government, was launched on Tuesday from the yard of Messrs. Vickers, Sons, and Maxim. A sister ship will be launched in a few months from the same works. The *Almirante Grau* carries a considerable armament, including two weapons firing a 100 lb. projectile effective against unarmoured craft at three miles range, and in addition there are eight 14-pounder guns and eight 1¼-pounder weapons. She has also tubes for firing torpedoes below the water-line. The vessel is protected the whole length. The engines give a collective horse-power of 14,000, and the new vessel will have a speed of 24 knots. She is 370 ft. long and only of 3,200 tons displacement, the draught being limited to enable her to enter all South American harbours. She will have a total complement of 300 officers and men.

Discharges in the Royal dockyards are to be resumed on April 1st. A further reduction of between 600 and 700 men is to be effected, but against this there will be a fresh entry of over 500 men in some departments, chiefly at Portsmouth and Devonport. The discharges will be carried out by instalments. Chatham's proportion of twenty-five men weekly for nine weeks will be the heaviest among the larger dockyards. It is contemplated that some 425 men in all will be affected at Chatham, but it is hoped, in adjusting trades, to find employment at other yards for some 225 of these. It is not practicable to bring about the reduction of staff wholly by natural wastage, but allowance has been made for this method to operate to the fullest possible extent. It will be necessary to discharge 200 men from Pembroke Dockyard.

The third and largest of the three new docks at Gibraltar was recently opened without ceremony and the [illegible] With the exception of a few minor details, Gibraltar Dockyard is now nearly completed. It has three large docks, numerous workshops, the latest plant, and an enclosed protected harbour capable of anchoring the combined Mediterranean and Atlantic Fleets.

Having undergone a refit costing upwards of £70,000, the battleship *Illustrious* was restored on Saturday to the active list of the Royal Navy, and was commissioned with the nucleus crew of the battleship *Repulse* for service in the Sheerness-Chatham Reserve Division until April 3rd, when she will have her crew brought up to full strength for service in the Channel Fleet.

The suggestions which have been handed in by employees at Portsmouth dockyard embrace a wide variety of subjects, including plans for fitting telescopic coal shoots between the decks of ships, for substituting electricity for steam power in some shops, and for a new method of issuing certain stores. It will be remembered that suggestions on the part of the men were invited by the authorities.

A Reuter telegram from Buenos Ayres states that the Council of Ministers has decided to appoint a commission, under the presidency of Rear-Admiral Manuel Garcia, to proceed to Europe for the purpose of studying the construction of warships. Argentina proposes to build two battleships of 13,000 tons and several torpedo craft.

As to the adoption of the Premium System for certain classes of machine work in some of the factories and shops in H.M.'s dockyards, chronicled some time ago in these columns, the Comptroller-General reports that in the course of the test examination which has been applied to the payments made during 1904-5, it has been found that the standard times (fixed by the professional officers) vary according to the capacities of different machines at the same yard, and vary also at different yards for apparently the same work, but the system is not yet sufficiently developed to admit of a test such as is applied to the payments for ordinary piece work with a view to ascertaining the financial effect.

The examination of wages of workmen employed on piece-work labour under the ordinary schemes of prices comprised a test of the earnings of fifteen trades, different trades being selected at the different yards. It was found that, with a few exceptions, due as a rule to the special skill of the workman, or to exceptional circumstances, the scales in force, while admitting of liberal earnings as compared with day pay, called for no remarks on the [illegible]

Technical Institution News.

Motor-Car Services and Tramways.

At a meeting of the Tramways and Light Railways Association, held on Tuesday last, Mr. W. Worby Beaumont in the chair, Mr. Norman D. Macdonald read a paper with the title "Motor-Car Services in Relation to Tramways." The author said that we were on the eve of great changes in regard to traffic. All street traffic would in future move at a much greater pace, and there would be a vast improvement in street surfaces. The inflexibility of tramways was a great cause of loss, because when the traffic of the tramway reached a certain point one got a string of cars checking each other, and the traffic was blocked. An omnibus service, on the other hand, could choose its own route and be converted into an express service by using practically deserted side streets. He had been consulted by the General Post Offices, both in London and in Edinburgh, as to the development of motor-car services for carrying the mails. It was somewhat curious that he had been asked to organise such services in the neighbourhoods of Edinburgh and Glasgow, where there was a veritable network of railways. Some tramway systems conveyed parcels, and in such cases an auxiliary service of motor vans would prove a great help, and the same idea could be expanded to freight traffic proper. In his opinion, the mobile motor vehicle might be made an auxiliary to the fixed tramway, and the question for tramway men to consider was whether they would treat it as a rival or utilise it as an adjunct to their own systems. With regard to light railways they had never had a fair chance in this country, and, in his opinion, with mechanical power road vehicles coming into more general use light railways were placed at a disadvantage. The North-Eastern Railway had abandoned a scheme for a light railway from Beverley to Beeford, a distance of fourteen miles, which would have taken two or three years to construct, and would have cost over £40,000, in favour of a motor-car service, costing comparatively little, which was put in operation at once, and gave a better service than the light railway would ever have given.

Wireless Telegraph Developments.

Mr. Marconi has laid before the Royal Society the result of some recent experiments. Mr. Marconi said that the information presented to the Society related to results observed when for the usual vertical antenna employed as radiator or absorber in wireless telegraph stations there was substituted a straight horizontal conductor placed at a comparatively small distance above the surface of the ground or water. When an insulated horizontal wire was connected at one end to a sphere of a spark gap, the other sphere of which was earthed, and sparks were caused to pass between the spheres, it would be noticed on investigating the space around such an oscillator that the radiations emitted reached a maximum in the vertical plane of the horizontal wire, and proceeded principally from the end which was connected to the spark gap, whilst the radiation was *nil*, or reached a minimum, in directions which were approximately 100 degrees from the direction in which the maximum effect occurred. He had also noticed that any horizontal conductor of sufficient length placed upon or at a short distance above the surface of the ground, and connected at one end through a suitable detector to earth, would receive with maximum efficiency only when the transmitter was situated in the vertical plane of the horizontal receiving conductors, and in such a direction that the end connected to the detector and to the ground was pointed towards the transmitting station. If, therefore, such a horizontal conductor was swivelled about its earthed end in a horizontal plane, the bearing or direction of any transmitting station within range of the receiver would be ascertained. He had carried out many experiments to establish the relationship.

Electric Winding in Collieries.

There was a very lively discussion at the Institution of Electrical Engineers last Thursday on this subject, and the interest it evoked is such that the matter was further debated at an overflow meeting held last night, the proceedings of which must wait for our next issue. There were two papers before the Institution. The one by Mr. C. P. Sparks dealt with the electrical equipment of the Aberdare collieries of the Powell Duffryn Company, and the other was the paper originally read by Mr. W. C. Mountain before the Manchester local section of the Institution. Mr. Sparks points out that the direct result of erecting a power station in the Aberdare Valley to supply the whole of the Powell Duffryn Companys pits was to lower the capital and generating costs. Owing to the nature of the business the drives could only be gradually transferred from steam to electric, and at the end of 1905 some 4,600 b.h.p. of motors were at work out of a total of 6,000. The records showed the colliery requirements to average 1,000 units per annum per b.h.p. in use, with a load factor on the power station of 37 per cent. Were the whole of the driving electric the output would be 12 million units per annum, and the load factor on the station between 40 and 50 per cent. With the present output of one and a quarter million tons per annum, ten units were required for all power purposes per ton of coal raised. When the cost of power was compared with the labour cost incurred in winning a ton of coal, the importance of increasing application of the power made the use of electricity a matter of interest to all colliery proprietors, and as the cost of electric machinery had been largely reduced in recent years there was every reason to believe that rapid progress would now be made in the conversion of collieries to electric driving. The cost per unit delivered to the colliery transmission line, with an output of 4½ million units per annum, load factor 37 per cent., using unwashed small coal, calorific value 13,000 b.t.u., with coal at 4s. 2d. per ton, was 0.365d.

Advantages of Steam Winding.

Mr. Mountain in his paper stated that the figures for electric winding did not compare at all favourably with the results which had been obtained with high-class steam winding engines, this being largely due to the heavy first cost of the plant. Even where the cost of the generating plant was eliminated it would appear from a table he submitted that the cost of labour, interest, and depreciation in the case of electric winding alone exceeded the cost at which coal could be wound with high-class steam winding engines. The charges which the consumer could afford to pay an electric supply company for current for electric winding would be on 1,000 tons, 500 yards deep, 0·35d. per unit; on 1,500 tons, 500 yards deep, 0·27d. per unit; on 2,000 tons, 700 yards deep, 0·18d. per unit. He gave these figures in comparison with the worst examples of steam winding, where the cost worked out at 16s. 11d. per 100 tons wound. The discussion was mainly directed to demonstrating the superiority of steam winding. Mr. Mountain was convinced that the cost of electric winding gears were so excessive that there was no probability of their being generally adopted in this country. Mr. J. Leggatt was of opinion that it would be very difficult to bring the cost of electrical winding out better than, or even as good as, steam winding. Moreover, steam winding figures could and would be improved. Mr. T. Campbell Futers said that it was all a question of cost. Reduce the initial outlay, and the greater efficiency of electric winding would secure for it a great future.

Equipment of Harbours and Docks.

In the course of a lecture before the Manchester Association of Engineers on Saturday, on the Equipment of Harbours and Docks, Mr. W. H. Hunter, speaking of the Manchester docks, said special arrangements had been made for dealing with grain in parcels and part cargoes. At the easterly end of the dock, he said, foundations have been formed upon which it is intended that a second grain elevator with a capacity similar to that of the elevator at Trafford wharf (40,000 tons) shall be erected. The elevator having been designed especially for dealing with parcels of grain will, instead of having one main marine leg, have on the side facing the quay six different legs for elevating grain, so that six different classes of grain may be received, weighed, and distributed at one time. For the conveyance of grain to this elevator house, special subways have been constructed in the dock walls. These subways will in each case be fitted with four sets of conveyor belts formed in lengths of 450 ft. each, and they will extend throughout the whole distance covered by the subways. Each belt in each length will be driven by an independent motor of 30 b.h.p., and the whole will form a system by which grain imported as part of the cargo of any vessel berthed in the dock will be lifted from the holds by means of moveable elevators of the crane type, passed through small hatches in the quay on to the several belts, and carried by the belts directly to the respective lifting legs in the elevator house.

Electric Traction on Railways.

Mr. J. G. Beharrell, of the North-Eastern Railway, has given before the York Railway Institute some comparative results of steam versus electric traction on rail[illegible] traffic, and said that, taking the experience of the North Eastern Railway Tynemouth branch, or the Lancashire and Yorkshire Railway line from Liverpool to Southport, they had the following advantages: Increased receipts, generation of power at a central station instead of on each locomotive, greater acceleration of service, increased speed, speed independent of the weight of the train, greater frequency of service, less rolling stock, more efficient lighting and heating, and cheap power available at all stations.

Application to Main Lines.

Dealing with the application of electric traction to main lines, Mr. Beharrell said he did not think that a more frequent service would induce an increase of traffic proportionate to that created on suburban lines. The question was one which waited on the development of electric supply, and until this had been carried much further than at present, he did not think the question of the electrification of main lines was within the range of practical politics in this country. In the application of electricity to freight traffic, the cost of the operation became of primary importance. The proper thing as regards freight traffic is not to run a frequent service of short trains, but to run as few trains as possible consistent with an efficient service, with the engine loaded up to the maximum allowed. With the experience of the Baltimore and Ohio Railway and other lines in America, in this respect he thought it was worth while the North-Eastern Railway seriously considering a proposal for experimentally working freight traffic by means of electric locomotives over a short section, where there is a heavy traffic, and in a district where a cheap supply of current could be obtained.

Bearings and Lubrication.

At a meeting of the [illegible] Technical College Scientific Society, held recently, a paper on "Metals Used for Bearings of Shafting and Lubrication of Same" was read by Mr. James Murdoch. The president, Mr. R. D. Munro, occupied the chair, and there was a large attendance. The lecturer treated the subject from a practical standpoint, and after discussing the various forms of engine bearings commonly used, proceeded to criticise their design, and the means adopted for ensuring the lubrication of the rubbing surfaces. A discussion followed, and at the close Mr. Murdoch was thanked for his paper.

Electricity in Mines

Before a meeting of the Birmingham Electric Club, Mr. R. G. Mercer has read a paper on "The Use of Electricity in Mines." He stated that electric haulage had doubled the output of one company's mines, and had reduced the cost of traction from 4d. to ½d. per ton, and effected a total yearly saving equivalent to 30 per cent. on the outlay of the electrical plant, so that in about three years the latter paid for itself. In another case, where mule haulage was used, the substitution of electric locomotives reduced the cost of traction from 5d. to ½d. per ton and [illegible] cent. of the cost of electrical installation

Reports from Abroad.

Continental.

German Iron Production.

The statistics collected by the Association of German Iron and Steel Masters show that the production of pig iron in the German Empire (including Luxemburg) during the month of February amounted to 935,994 tons, which compared with 1,018,461 tons in the previous month and 672,473 tons in February last year. This is a decrease of 82,467 tons, or 8·1 per cent., on January. The Association, however, properly point out that taking into account the fewer working days in February there is no real decrease, the output per working day being, in fact, 575 tons larger in February than in January. Compared with February last year, there is an increase of 263,521 tons, or 39·2 per cent., but here, again, it must be borne in mind that last year the great strike curtailed the output. For the first two months of the year there is an [illegible] tons, or 36 per cent.

German Iron and Coal.

The condition of the Rhenish-Westphalian iron market remains satisfactory. The home demand for pig iron and half-manufactured products is still strong. In order to meet the demand the Pig Iron Syndicate has been obliged to buy at high prices in England. The Steel Works Association has decided to increase by 5 per cent. its production of half-manufactured products, bar iron, and railway material, which amounted to 437,559 tons in February last, as compared with 320,890 tons in February, 1905, and 459,833 tons in January of this year. The Rhenish-Westphalian Coal Syndicate disposed of 6,577,000 tons of coal in January, and 6,139,000 tons in February. The amount of coke disposed of was 1,200,000 and 831,000 tons respectively for the same months. The syndicate has resolved to reduce its coal production by [illegible] per cent., and its coke production by 5 per cent.

Turbines in Large Ships.

On the question of the policy of the huge liner and the wisdom of employing turbines, the managing committee of the North German Lloyd Company states in its report that the three large fast steamers, *Kaiser Wilhelm der Grosse*, *Kronprinz Wilhelm*, and *Kaiser Wilhelm II.*, are continuing to prove a great attraction in the Transatlantic passenger traffic. The Stettiner Maschinenbau Actiengesellschaft Vulcan, of Stettin, have been entrusted with the building of a new fast steamer of the size and speed of the *Kaiser Wilhelm II.*, which is to be called *Kronprinzessin Cecilie*. This steamer also will be fitted with piston-engines, as, after continued exhaustive and careful trials as to the employment of turbines at sea as [illegible] engines, the committee have come to the conclusion that, although a future cannot be denied to the turbine, its performances hitherto achieved do not afford a [illegible]ular working of trans-oceanic traffic.

German Electrical Industry.

The society for protecting the business interests of the German electrical industry has issued a report on the condition of that trade during 1905, which indicates further considerable progress. The development of the industry during the year was chiefly in equipping the coal and iron industry with installations for hoisting, ventilating, pumping, illumination, transporting labourers and materials above and under ground, and for other purposes. In all this the utilisation of gases escaping from blast furnaces played a conspicuous part. The growth of the industry is reflected in an increase of nearly 10,000 employees in the various manufacturing establishments of the country. The number of workmen employed was about 82,000, as compared with 72,500 in 1904, and 26,321 ten years ago. The report mentions a considerable increase in the number of small electrical concerns engaged in manufacturing one or more special articles. With such establishments the increase in the number of workmen was about 20 per cent. for the year, while the two great manufacturing trusts of Berlin reported a gain of only 10 or 11 per cent.

Developments in the Aluminium Industry.

The past year was a very prosperous one for the aluminium industry. Not only was there a considerable expansion in the demand, but the range of prices was higher than in any year since the inauguration of the electrolytic system of production. By an agreement arrived at some years ago the whole of the European demand for aluminium is, we are reminded, reserved to the European companies, to the exclusion of the American firm, the Pittsburg Reduction Company. At present the world's requirements of this metal are met by only five companies, owning twelve works. In a few months' time the European output will be largely increased by the new works which are being erected at Wallis (Switzerland), where water power to the extent of 50,000 h.p. is to be brought into requisition to drive ten turbines. By the erection of other works on the Rhone during the course of the ensuing summer an equal amount of water power will be made available; and a concession which has been secured by the Neuhausen Company to utilise the Rhine rapids at Rheinau is another proof that German capital is flowing more freely into the aluminium industry now that its commercial possibilities have been attested. By the erection of extensive works in the centre of Italy an output of over 6,000 tons will, it [illegible]

French Canal Construction.

It is proposed to undertake the construction of canals from Nantes to Angers, Orleans to Briare, Tours to [illegible] to Moulins, Roanne to St. Etienne, and [illegible] of the Loire canals.

These waterways would be [illegible] seventy years to the local chambers of commerce, constituted as syndicates with power to levy tolls and raise money for the purpose of defraying the expenses. Should the chambers of commerce not undertake the responsibility, private companies would be empowered. The State would guarantee interest up to 14,000,000f. in case of insufficient receipts. The whole of these enterprises are estimated to cost 800,000,000f.; their carrying-out would connect Nantes with Paris and Paris with Basel, and might possibly, says a Times correspondent, divert to the French route some of the traffic between [illegible]

A New Method of Cutting Steel.

A new method of cutting steel was recently described by Eugene Lemaire in La Nature of Paris. In conducting the first experiments directed toward the perfection of the new process, an oxyhydrogen flame was used which first heated the iron red hot. The supply of hydrogen was then diminished and that of oxygen increased. The application of the increased [illegible] thorough. In the end the workman only obtained an irregular cutting, the edges of which were coated with oxide. The later method is to use two pipes, moving them along the mark to be cut. The first is an oxyhydric pipe which heats the metal red hot, and the second the point of which is about 25 cm. from the first—emits a jet of oxygen which literally burns the iron. Under these circumstances the operations are more quickly performed, and the oxide is very fluid and is easily expelled. The section is cut as clean as if done by a saw, and the width of the cut does not exceed two mm. for a plate 15 mm. in thickness and three mm. for a plate 100 mm. in thickness. The rate of speed for the 15 mm. plate is 20 centimetres a minute, and the consumption for every metre of cutting is a few litres of hydrogen and about the same amount of oxygen. The apparatus is very simple and is not only adapted to cutting plates, but [illegible] in getting a process which would cut armour plates, but it is claimed that the new process completely solves the problem.

Colonial and Foreign.

Sources of Vanadium.

This metal has come into prominence within the last four or five years, on account of the great increase in tensile strength, elasticity, and ductility it imparts to steel when added only to the extent of about 0·2 to 0·5 per cent. Its most important ore is vanadinite or chlora-vanadate of lead. In the pure state it should contain 19·35 per cent. V_2O_5, but the ores actually used for the manufacture of ferro-vanadium generally only contain in the neighbourhood of 10 per cent. V_2O_5. Such an ore is worth in London about 4s. to 5s. per kg. of V_2O_5 contents, assuming that it tests over 10 per cent. The metal is found in quite a number of rare minerals, such as dechenite, vanadite, carnotite, etc. The ash obtained from anthracite, found at Yauli, in Peru, is said to contain as much as 25 per cent. of V_2O_5. Vanadium ores are found in limited quantities in Spain, the Argentine Republic, Mexico, Sweden, and the United States.

Japan Shipbuilding.

Owing to the accumulation of orders at the Kawasaki Shipbuilding Yard, Japan, it has been decided to carry out extensions of the works and dockyard on a large scale. It is proposed to establish large branch works in the neighbourhood of the Hyogo Canal, and to construct at the dockyard a berth capable of receiving a vessel of 15,000 tons. The capital of the company will be increased in order to provide the funds necessary for the extension.

Argentine Railways Construction.

The narrow gauge line from Rosario to Buenos Ayres has been commenced; one across the Chaige will be made as quickly as possible; the Argentine Great Western is constructing branches; the Chilian part of the Trans-Andine Railway has just been opened to Funcal, 20 kilometres from the point at which the tunnel will have to be made, one-half by the Chilian Company and the other by the Argentine. These 20 kilometres will be difficult of construction; there will be several short tunnels, and at other points the line will be cut out of the side of the rock, leaving a projecting roof as a protection against avalanches of snow and the fall of stones from the heights. It is to be feared that the traffic of this railway will be frequently interrupted by these causes and by the floods which occur every year when the snow melts.

Mono-Rail and Underground Tramming.

At a recent meeting of the South African Association of Engineers, Mr. A. U. K. Pierce gave some details of a scheme which had been proposed for underground tramming, by means of a rail suspended from the roof on which cars were to be towed by means of an electrically operated trolley running on the same rail. The estimated capital cost of equipping a mine, including motor generator sets for converting the assumed available three-phase current to direct current for operating the trolleys, amounted to £550 per trolley, and while the operating cost, including an allowance of £5 per month per trolley for repairs, amounted to just over one penny per ton hauled, assuming the average length of haul to be 800 ft., and the cost of the alternating current delivered to the motor-generator set at 2d. per kw. hour. Adding interest at 7 per cent., and amortisation at 15 per cent. on the capital cost, the cost per ton hauled worked out at 1.8d.

Machinery in Transvaal Mines.

According to the Transvaal Government Mining Engineer there were, at the beginning of 1905, seventy mines crushing and forty developing, and of these fifty-four and twenty-one respectively were [illegible]

[illegible] seventeen respectively were using rock-drills. For the transport and elevation of ore, waste rock, and tailings in the surface works of the mines the belt conveyor is being extensively used [illegible]

[illegible] mine, the total number being seventy-one and the horse-power 1,206. There were 51 Cornish pumps, 34 pumps electrically driven, 23 air driven, 59 steam driven (other than Cornish), one pump driven by [illegible]

United States.

American Iron Market.

The Iron Age states that the iron market has continued to drift with but little sign of anything stirring ahead. The chief restraining influence has been the uncertain situation regarding the coal strike, and the coke market reflects preparations by users for a strike of bituminous miners. Pig iron consumers, however, have made no precautionary purchases so far. Southern producers maintain their prices, but buyers observe a waiting attitude. It is now thought that the Steel Trust will probably purchase its outside requirements of pig iron for the second quarter month by month as needed. The Steel Corporation is much pushed for delivery of finished steel, notwithstanding its producing capacity of 48,000 tons of ingots per day. The rail trade is a conspicuous exception to the general situation, and the production promises to exceed last year's, which reached fully 3,300,000 tons. The Hill roads have during the week bought 50,000 tons, and total purchases since last report aggregate about 100,000 tons. Contracts for structural steel are being delayed until more settled conditions become effective, but an enormous business for the mills is assured. Labour troubles may delay the [illegible] ore.

The Quebec Bridge.

Something in the nature of a scare is being manufactured in connection with the new Quebec Bridge. A well-known transatlantic engineering magazine has stated that the height of the bridge will be insufficent to permit the passage of the larger steamships which are certain to be built within the next few years. The chief engineer of the Harbour Commissioners of Montreal states that he does not think that there is any foundation for the scare. He adds that the fixed bridges over the Manchester Ship Canal are no higher than 75 ft., and this height had only been accepted after much inquiry and discussion by the canal, shipping, and civil authorities. If a great and progressive community like Manchester felt that there was no danger to its interests from a 75 ft. bridge over the canal, he did not think that the trade of Montreal would be jeopardised by a bridge of twice that height [illegible]

Engineering Features of the Bridge.

In view of what has been said as to the possibility of the bridge proving a hindrance to navigation, a few details concerning the structure may be of interest, although [illegible] pointed out that the work has already been described and illustrated in Page's Weekly. Hitherto the Forth Bridge, with a span [illegible] of place amongst single-span bridges, but the Quebec Bridge is designed with a span of 1,800 ft., while the bridge itself has a total length of 2,800 ft., the anchorage piers being each 500 ft. from the channel piers. The lowest point of the bridge will be 150 ft. above high-water, and the total weight of the superstructure will be, roughly, 40,000 tons. A good deal of the steel work has already been completed, and the bridge is expected to be ready for traffic by the end of 1908. The magnitude of the operations involved has necessitated the construction of special plant. The total cost is put down at $4,000,000, provision being made for two railway tracks, two electric car tracks, and two highways.

New Plant of the Bethlehem Steel Corporation.

The improvements at the Bethlehem plant of the Bethlehem Steel Corporation are referred to in the American press as likely to be completed in about fifteen months. The plans include the building of five large, modern blast furnaces, a coking plant, the first unit of which will embrace 50 ovens, a drop forge plant and a shop for the manufacture of fine machinery and tools. It is understood that for the machine and tool shop alone $2,000,000 has been set aside. The structural steel mills which form an important part of the improvements have excited a great deal of interest, for the process to be employed has never before been used on a large scale in the United States. The process differs little from the Gray process developed several years ago at Duluth, and permits the rolling of very large beams and sections hitherto built up of smaller riveted sections.

Benjamin Franklin Bicentenary.

Sir George Darwin has [illegible] New York to represent the British Association at the Benjamin Franklin bicentenary. He brings an address and congratulations from the British Association to the American Philosophical Society, which was founded [illegible]

New Croton Dam Completed.

The completion of this important work is now announced. The dam is 300 ft. high from the lowest point in the foundations to the crest, and is thus the tallest dam in the world. It form a reservoir 18 miles long, and impounds about 32,000,000,000 gallons of water. It is built of solid granite ashlar and rubble, except that the south extension is backed with cyclopean concrete, it has a spillway 1,000 ft. long at right angles to the axis of the dam and 16 ft. below its crest, and contains altogether about 855,000 yards of masonry. A description of [illegible]

Launches of the Week.

[illegible] Turbine steamer *Kingfisher*; dimensions, 275 ft. [illegible] independent Parsons compound steam turbines; estimated speed, 20 knots; built to the order of the General Steam Navigation Company, Ltd., for service on the Thames.

JOHN READHEAD AND SONS, West Dock, South Shields (March 22nd). Screw steamer *Tremayne*; dimensions, 358 ft. 6 in. by 40 ft. 6 in. by 27 ft. 11 in.; triple-expansion engines constructed by builders; cylinders 25 in., 42 in., 68 in. by 45 in. stroke, supplied with steam by two steel boilers working at 180 lb. pressure; built to the order of the Main Steamship Company, Ltd., St. Ives. This is the forty-seventh vessel contracted for these owners by Readhead and Sons.

R. AND W. HAWTHORN, LESLIE AND CO., LTD., Hebburn-on-Tyne (March 24th).—Passenger, mail and cargo steamer *Rupara*; dimensions 230 ft. by 36 ft. by 23 ft. 6 in.; the engines, constructed at the St. Peter's department of the firm, will be of the triple-expansion type, cylinders 20 in., 33 in., 54½ in. by 39 in. stroke, with two boilers, working at 180 lb. pressure; estimated speed 12 knots; built for the South Australian trade of the Adelaide Steamship Company.

ALEX. STEPHEN AND SONS, LTD., Linthouse Works (March 27th).—S.S. *Barranca*, specially constructed for the fruit trade; dimensions, 372 ft. by 47 ft. 6 in. by 32 ft. 6 in.; gross tonnage, 5,000; her engines will have cylinders 28 in., 45 in., and 75 in. by 51 in. stroke; S. E. Hall, of Dartford, supply refrigerating plant; built for the West Indian trade of Elders and Fyffes, Ltd.

SUNDERLAND SHIPBUILDING COMPANY, LTD., Sunderland (March 26th).—Steel screw steamer *Austa*; dimensions, 229 ft. by 35 ft. by 17 ft. 4 in.; machinery by the North-Eastern Marine Engineering Co., Ltd., cylinders 16½ in., 27 in., and 44 in. by 33 in. stroke; steam supplied by a large boiler working at 175 lb. pressure; built to the order of the Aktieselskabet Dampskibsselskabet From, Copenhagen.

WILLIAM DOBSON AND CO., Walker-on-Tyne (March 24th).—Steel screw steamer *Alster*; dimensions, 354 ft. by 48 ft. by 28 ft. 5½ in., the propelling machinery by the North-Eastern Marine Engineering Co., Ltd., consists of a set of triple-expansion engines having cylinders 24½ in., 40 in., 67 in. by 45 in., three large boilers working at 180 lb. pressure; estimated speed 11 knots; built to the order of Syndikats-Rhederei G.M.B.H., Hamburg.

SIR W. G. ARMSTRONG, WHITWORTH AND CO., Walker Shipyard (March 27th).—A self-propelling buoy [illegible] 15 ft.; fitted with triple-expansion propelling machinery by the North-Eastern Marine Engineering Co., Ltd., Wallsend, cylinders 12½ in., 20 in., and 33 in., by 24 in. stroke; steam supplied by one [illegible] to the order of the Commissioners of the Port of Rangoon. The vessel is intended to lay and recover first-class moorings and ground chain, which always lie deeply buried in the mud, and for this purpose she has been specially strengthened.

HAWTHORNS AND CO., LTD., Leith (March 26th).—Second of the two lightships which they have under construction to the order of the Commissioners of Northern Lighthouses. This vessel, like her sister ship, will be fitted with a complete installation [illegible] and when completed will be stationed on the West Coast of Scotland.

DAVID AND WILLIAM HENDERSON AND CO., LTD., Glasgow (March 23rd). Twin-screw steamer *Cyclops*; dimensions, 500 ft. by 58 ft. by 42 ft. 6 in.; builder supply twin engines, cylinders 23 in., 38½ in., 65 in. by 48 in. stroke; three boilers on the closed ashpit system of forced draught for a working pressure of 190 lb.; gross tonnage, about 9,000 tons; built for the Ocean Steamship Company, Ltd., Liverpool.

[illegible] 342 ft. by 47 ft. 6 in. by 24 ft. 6 in.; triple expansion engines by the Central Marine Engine Works; cylinders 23½ in., 38 in., 64 in. by 42 in. stroke; built for H. Samman and Co., Hull.

SIR W. G. ARMSTRONG, WHITWORTH AND CO., LTD., Newcastle (March 26th). Steel screw steamer [illegible] capable of carrying 8,000 tons on moderate draft; the Wallsend Slipway and Engineering Company, Ltd., supply triple-expansion engines; cylinders 27 in., 45 in., 75 in., with a stroke of 48 in.; three boilers working at 180 lb. pressure.

JOHN PRIESTMAN AND CO., Castletown (March 26th).—[illegible] the North-Eastern Marine Engineering Company, Ltd., Sunderland; cylinders 25 in., 41 in., 40 in. by 48 in. stroke; boiler pressure 180 lb.; built to the order of Robert Harrowin and Co., Whitby.

SWAN, HUNTER AND WIGHAM RICHARDSON, LTD., Neptune Works (March 26th). Twin screw mail and [illegible] supplied with steam from two large boilers by the [illegible]

MONT[illegible] (March 2[illegible]th).—Steel screw steam trawler *Capella*; dimensions 145 ft. by 2[illegible] ft. [illegible] in. by [illegible]; Mr. W. V. V. Lidgerwood, Coatbridge, supplies triple expansion engines; cylinders 13 in., 22 in., 37 in. by 27 in. stroke; boiler by J. T. Eltringham and Co., South Shields; speed 12 knots on the consumption of 6 tons per day; built for French owners to be engaged in Newfoundland fishing.

ROBERT THOMPSON AND SONS, Sunderland (March 22nd).—Single deck steamer *Arndale*; dimensions, 340 ft. by 48 ft. 6 in. by 25 ft. 9 in.; engines and boiler by the North-Eastern Marine Engineering Company, Ltd., cylinders. 24½ in., 40 in., 66 in. by 45 in. stroke; boiler pressure, 180 lb.; built to the order of Thomas Smailes and Sons Steamship Company, Ltd., Whitby.

HARLAND AND WOLFF [illegible] (March [illegible]nd).—Twin screw steamer *Ortega*: dimensions, 465 ft. by 56 ft.; gross tonnage about 8,000; two sets of quadruple expansion engines will be supplied by the builders, and the propellors will be of manganese bronze; built for the Pacific Steam Navigation Company, for service between Liverpool and the eastern and western ports of South America.

ROBERT STEPHENSON AND CO., LTD., Hebburn-on-Tyne (March 24th).—Twin-screw passenger ferry *Iris*; dimensions, 160 ft. by 40 ft. 6 in. by 11 ft. 6 in.; designed to carry over 1,700 passengers; machinery cosntructed by D. Rollo and Sons, Liverpool, consists of two sets of surface condensing engines, each driving a separate shaft on which is a three-bladed propellor; two single-ended boilers; speed [illegible] knots; built to the order of the Wallasey Urban District [illegible] on the Mersey.

Trial Trips.

C[illegible] TAYLOR [illegible], Stockton-on-Tees (March 2[illegible]nd).—[illegible] steamer *D[illegible]*; dimensions, 360 ft. by 50 ft. 1 in. by 25 ft. 10 in.; engines constructed by Blair and Co., Ltd., Stockton-on-Tees, cylinders, 25 in., 41 in., 67 in., by 45 in. stroke; two steel boilers working at 180 lb. pressure; speed 11½ knots; built to the order of the Buenos Ayres and Pacific Railway Company, Ltd., London.

NORTHUMBERLAND SHIPBUILDING COMPANY, LTD., Howden-on-Tyne (March 21st). Steel screw steamer, *Midgard*; dimensions, 372 ft. by 48 ft. 10 in. by 30 ft. 10 in.; Richardsons, Westgarth and Co., Ltd., supply engines, cylinders 25 in. 41 in., 69 in. by 48 in. stroke; three steel boilers 14 ft. by 10 ft. 9 in., working pressure, 180 lb.; she will carry about 7,300 tons loaded; speed 11 knots; built to the order of Furness, Withy and Co., Ltd., West Hartlepool, [illegible]. The "Midgard" [illegible] Deutsche Seeverkehrs Aktiengesellschaft.

TYNE IRON SHIPBUILDING CO., LTD., Willington Quay on Tyne (March 24th).—Steel screw steamer *Tricolor*; dimensicns, 351 ft. by 50 ft. by 28 ft. 1½ in.; engines supplied by Blair and Co., Ltd., Stockton-on-Tees, of the triple-expansion type, cylinders, 26 in., 42½ in., and 69½ in. by 45 in. stroke and working at a pressure of 180 lb.; built to the order of W. Wilhelmsen, of Orsnoes Tonsberg, Norway.

M[illegible] THOMSON'S SH[illegible] YARD, Govan (March 21st).—Steel screw fleeter *Horatio*; dimensions, 108 ft. 6 in. by 21 ft. 6 in. by 12 ft. 4 in.; triple-expansion engines by W. V. V. Lidgerwood, Coatbridge; gross tonnage about 173, net 52; speed, 9¾ knots; built to the order of the Hellyers Steam Fishing Co., Ltd., Hull. This vessel is the sixth of an order for fifteen for the same owners.

IRVINE'S SHIPBUILDING AND DRY DOCK COMPANY, LTD., West Hartlepool (March 24th).—S.S. *Evelyn*; dimensions, 352 ft. by 48 ft. 3 in. by 24 ft. 3 in.; engines of the triple expansion type have been supplied and fitted by Blair and Co., Ltd., Stockton, having cylinders 24 in., 40 in. and 63 in. by 45 in.; stroke, with two large single-ended boilers, working at 160 lb. pressure; speed attained, 12 knots; built for Thomas Appelby and Co.

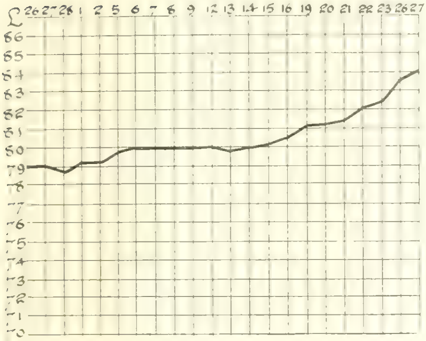
Cable Ships.

An illustrated account of the works of the India Rubber, Gutta Percha, and Telegraph Works Company, Ltd., which has just been issued, describes the cable vessels owned by the company and fitted for the purpose of laying submarine cables. These steamers are three in number, and are respectively named the *Silvertown*, the *Dacia*, and the *Buccaneer*. The *Silvertown* is remarkable for the size of her cable tanks, which will receive nearly 5,000 tons of cable. The heaviest load she has carried, when on a cable expedition, was composed of 4,880 tons of cable, 1,6[illegible]0 tons of coal, 110 tons of buoys, chains, grappling rope, and cable gear, and 160 tons of provisions and fresh water, amounting in all to a cargo of 6,810 tons. Her draught of water on this occasion was 27 ft. forward, and 29 ft. 6 in. aft. The other ships, whose size is indicated by the order in which they are named, have a collective cable capacity of 4,200 tons. The machinery on board all these vessels for laying cable is more or less of the same character. At the stern is the "paying out" gear, by means of which, as the name indicates, a cable is paid out from the ship; it consists of a large iron drum, an arrangement of very powerful brakes, and, for use if required, a pair of horizontal engines. In the fore part of the vessel is placed the "picking up" gear, composed of two large iron drums of heavy construction, worked, together or separately, by a pair of powerful engines. This machinery is employed in grappling for a cable, and in raising it from the bottom. Dynamometers, for indicating the strains on a cable or on a grappling rope, and a variety of quadrants, guides, sheaves, pulleys, and strong brakes are necessary adjuncts to both the "paying out" and "picking up" gears. Sounding machines, for ascertaining the depth of water, are [illegible] at the stern, and are worked by light [illegible] engines.

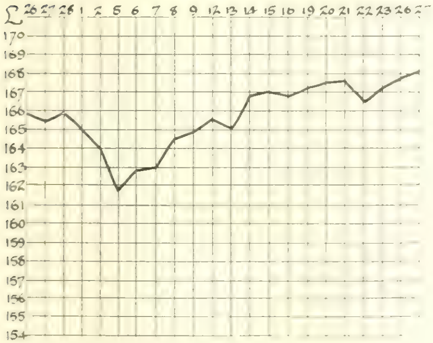
The Home Metal Market.

Showing Daily Fluctuations from February 26th to March 27th, 1906.

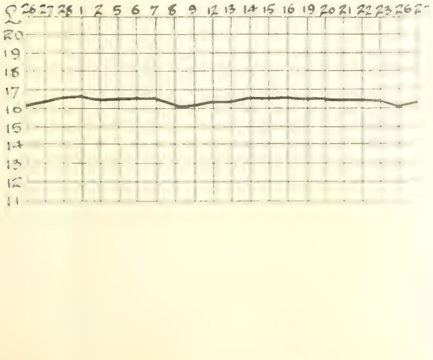
Copper.



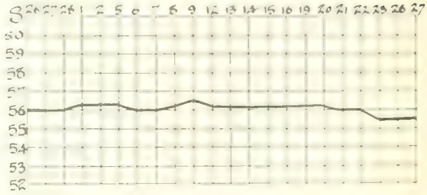
Tin.



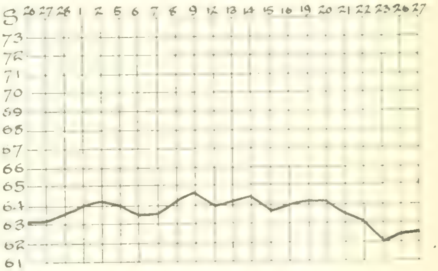
English Lead.



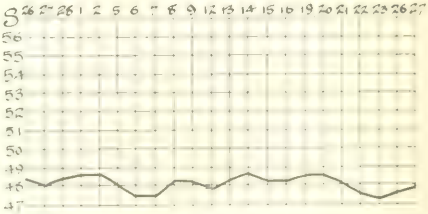
Pig Iron : Scotch,



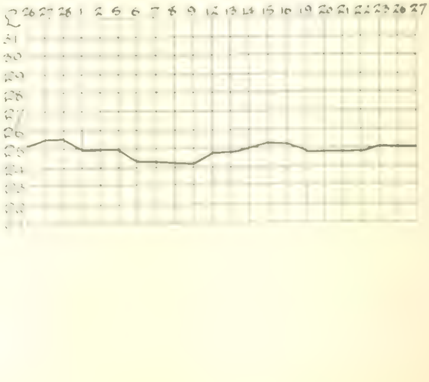
Hematite,



Cleveland.



Spelter.



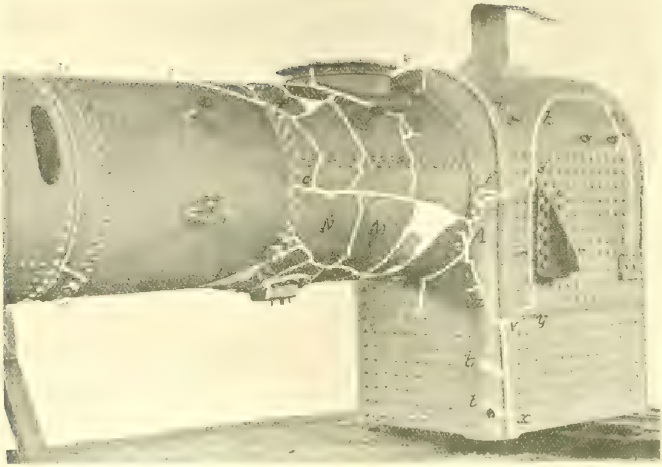


Fig. 1.—Lines of fracture outlined on a boiler identical with that on locomotive [illegible]. Left side. The white patches show the location of the pieces which were not recovered.

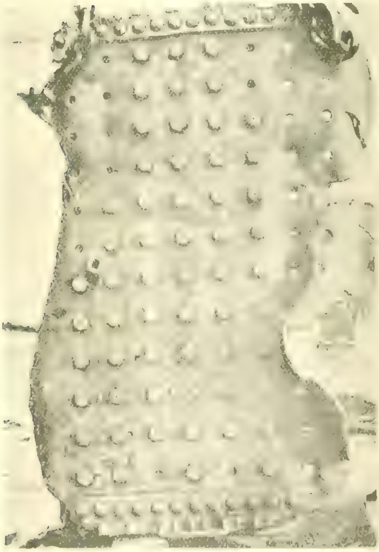


Fig. 2.—Crown sheet seen from below.

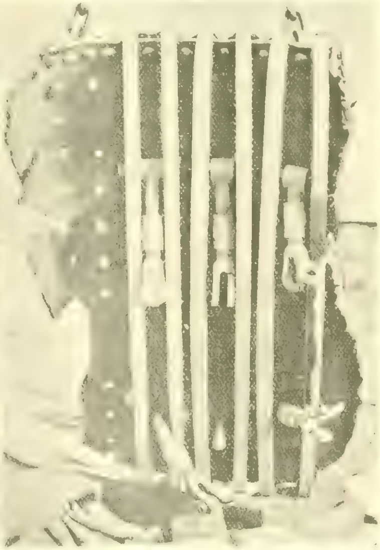


Fig. 3.—Crown [illegible]

EXPLOSION OF A FRENCH LOCOMOTIVE BOILER.

Explosion of a Locomotive Boiler near the Saint-Lazare Station, Paris.

Abstract of Investigation by Robert Dubois.

ON July 4th, 1904, at about 11 a.m., the boiler of locomotive No. 626, of the French Western Railway Company, exploded near Saint-Lazare station. The locomotive was then standing still in the cutting which extends between the Pont de l'Europe and the Batignolles tunnel.

The explosion was extremely violent: the engine was smashed altogether and blown to pieces. The fragments of the boiler, which were mostly hurled long distances, fell in the roads and on houses; fragments were found all over the district, and it is a wonder that no one was struck by this hail of projectiles. Some minor injuries only resulted from the projection of stones and gravel. The whole loss was the damage produced, which amounted to about £8,000.

Three separate inquiries into the cause of this explosion were made. Mr. Périssé, the expert appointed by the *juge d'instruction*, has published a summary of the technical part of his report in a note which appeared in the Génie civil. The government engineers have published nothing about their work, but Mr. Frémont, civil engineer, whom they appointed to work with them, has enunciated his personal opinions as to the causes of the accident in the Bulletin de la Société d'encouragement pour l'Industrie Nationale for March, 1905. Finally, the engineers of the French Western Railway have carefully and minutely examined the fragments, and it is the results of their investigations which are described.

Mr. Périssé attributes the accident to effects of expansion and contraction, which would have produced a gradual destruction of the lower part of the barrel plate in front of the fire-box. Mr. Frémont maintains that the explosion began at the left hand side of the front plate of the fire-box; that it was due to the weakness of the metal, and that it is the consequence of an old flaw, the existence of which he assumes *a priori*.

We, like the company's engineers who have investigated the question, think that the explosion originated in the collapse of the crown of the fire-box. This also is the opinion of Mr. Walckenaer, who has examined the fragments of the boiler with the greatest care. However, we are not able to trace matters back further and determine what the causes of that collapse were. Thus the three inquiries lead to quite different conclusions; this is not surprising, as the boiler is broken up so much that one is tempted to discover the start of the explosion in every fragment.

To make an investigation of this kind requires a very considerable knowledge of the locomotive. It is therefore necessary to give some account of its construction in order to make it possible to understand the phenomena which occurred, and to discuss them.

Let us first consider the boiler: it has a very deep fire-box, with longitudinal stays, and with adjustable ties; inside the fire-box there is a brick arch carried on two bearers which—note this point—are simply carried on studs screwed into the fire-box. We note outside of the fire-box: (1) on the sides of the fire-box, two large brackets, by means of which the boiler is supported on the frame, and two small supports, which we will use as datum marks; (2) on the back face, a heel-shaped projection which prevents the lateral displacement of the boiler. We may also mention a blow-off cock on the right-hand side of the fire-box, a mud-box below the barrel, and a drop-plate supported by the foundation ring.

Let us next take the frame: it is carried on two coupled axles, between which the fire-box is placed, and on a leading bogie; the main frame plates are outside the wheels, but inside there are two small longitudinals on the two sides of the fire-box; these longitudinals are fixed at one end to the trailing buffer beam and are connected in front of the fire-box by cross-bracing, which itself is fixed to a longitudinal placed centrally. The cylinders are inside and the crank driving axle has a central bearing which is fixed to this middle longitudinal. On each side, between the wheels, the small longitudinals are secured to the main frame plates by steel castings, which also serve as supports to the boiler; these castings go down very far and are connected together by a tie which is below the fire-box; the tie is practically vertically under the pivots of the drop-plate. Finally, the trailing buffer beam has a U-shaped guide into which the heel-shaped projection of the boiler takes.

This locomotive was one of a series of fifteen locomotives (series 621 to 635) built in 1888 by the Fives-Lille Company. In 1900, it was materially altered at the shops of the French Western Railway, and extensive repairs were carried out on the boiler; the fire-box was renewed, also the back plate, half the front plate, and the lower parts of the outer shell; hence the horizontal line of rivets just behind the small longitudinals when the boiler was in place on the frame.

On July 4th, 1904, locomotive 626, hauling a Mantes train, had arrived at Saint-Lazare station at 8 h. 54 m., and was to start at noon. While waiting it was standing on a siding in the Europe cutting. While thus standing still, the two men forming the crew of the locomotive were off duty and were replaced, as far as supervision was concerned, by the men stationed at the Saint-Lazare depôt. At 10 h. 45 m. the explosion took place, nothing having previously happened in any way calculated to draw attention to the locomotive concerned.

Examination of the fire-box crown (figs. 1 and 2) shows that this became separated, dragging off with it the upper edge of the tube plate and that of the back plate. Moreover, the general shape of its two sides is very striking; these, instead of being turned downwards, are clearly turned upwards (except at one place subjected to subsequent deformation), and this appearance at once gives the impression that the crown became detached [illegible] wards. Equally noticeable is the toothed form of that part of the back plate which came away together with the crown; the ends of the stays form the teeth of this fracture.

The corresponding fracture found at the back of the [illegible]

[illegible] vertical force. On the right-hand side of the same figure, the back part of the left side of the fire-box is shown; the distortion clearly shows that the fracture was the result of a downward pull; the same kind of fracture is also apparent along the whole of the fracture at the top of the left side, and is found on the right side as well. These different deformations of the crown and of the sides thus show that the crown collapsed before the fire-box blew to pieces, and that this collapse cannot be due to the sides going apart.

The large opening produced at once allowed a brisk flow of water and steam to enter the fire-box, and the resulting pressure inside bulged out the fire-box plates. The presence of the grate and the depth of the fire-box fully explain the production of this sudden internal pressure, the external results of which will inform us as to the position of the boiler at the moment the crown gave way and as to the movements which resulted from its giving way. The particular arrangement of boiler, with deep fire-box (which fully explains the extension of the explosion to the barrel) and the way the barrel broke up (which breaking up was only a result of first giving way at one point) show that, in spite of the breaking up of the boiler, the explosion can fully be understood without any need of adopting any theories of instantaneous overloads such as are produced by explosives.

The observations we have made clearly prove that the explosion cannot have started otherwise than by the giving way of the crown; even if the details of the phenomena are left out of consideration, the perfect symmetry in the earlier movements of the boiler and the fracture of the back ring of the barrel along a lateral generatrix, are general facts which put out of court any idea of looking for the start of the explosion in the barrel; for if a symmetrical phenomenon may easily produce in succession unsymmetrical results, the converse is improbable. Moreover, without going in for such abstract considerations, we may remark that if the fracture had started in the barrel, this latter opening out laterally, the first effect would have been to tilt the boiler as a whole and the perfectly symmetrical marks on the fire-box would not have been produced.

But why did the crown of the fire-box give way? It is impossible for us to answer this question, as we are unable to determine what particular part or stay it was that first gave way. But although the staying of a fire-box crown is the delicate part of a boiler, it seems hardly possible that the fire-box crown of locomotive 626 gave way unless there was an excess of pressure in the boiler.

Although we have not been able to ascertain that any such excess of pressure was really produced, and although the evidence of the employees, who, it is true, may be considered as prejudiced parties, even tends to prove the contrary, the company has come to the conclusion that it must give up the pattern of safety valve with which locomotive 626 was fitted.

This pattern of valve, very extensively used in England, was adopted by the French Western Railway Company twenty years ago, on account of certain advantages it possesses; but during the last ten years preference has been given, for new locomotives, to an improved type.

At present this new type is being put in, instead of the old, on locomotives fitted with the latter; this alteration will soon be completed, and there is every reason to hope that this measure, together with increased care in the examination of fire-box [illegible] will [illegible] the recurrence of the accident which led to it.

Bulletin de [illegible]

Exhibition News.

Argentine.

In order to celebrate the fiftieth anniversary of the opening of the first railway line in the Argentine Republic, the Argentine Government has decided that a railway exhibition shall be held at Buenos Ayres on August 30th, 1907.

Russia.

A Consular report states that the Electro-technical Exhibition which was to have been held at Kieff on March 25th to April 7th, 1906, has been postponed until April, 1907. The Congress of Electro-technical Engineers has also been postponed till that date.

Italy.

H.M. Consul at Milan has sent particulars of an international competition for a machine for sweeping the streets. This should be so constructed as to collect the mud into a box of a cubic metre in capacity, to work on streets paved with stones, cobbles or asphalt, and is to be an automobile of any system, not requiring more than two men to work it. Machines must be submitted not later than July 31st. There will be awarded a first prize of £[illegible], and a second of £[illegible].

Shipping Returns.

The tonnage of vessels entered at ports in the United Kingdom from foreign countries and British possessions, with cargoes, during the month ended February 28th, 1906, amounted to 2,800,035 tons, and the tonnage cleared to 3,870,448 tons, as against 2,698,370 tons entered and 3,693,272 tons cleared in the month of February, 1905. With regard to the coasting trade, the tonnage entered with cargoes during February, 1906, amounted to 2,527,832 tons, and the tonnage cleared to 2,472,158 tons, as against 2,489,965 tons entered, and 2,475,711 tons cleared in February, 1905.

Obituary.

KARL HEINRICH VON SIEMENS, whose death has occurred at Gorbio, near Mentone, was an active member of the family of brothers associated with the firm of Siemens and Halske. The network of telegraph lines which covers Russia was laid by Herr Karl von Siemens for the Tsar's Government fifty years ago, and was maintained by the firm for twelve years, during which period he had charge of the great factory established in St. Petersburg. In 1869 he came to London to take control of the business established here. Herr Karl von Siemens was personally in charge of the laying of the Direct United States cable, the first across the Atlantic contracted for by Siemens Bros. Also he was the first who succeeded, with the ship *Faraday*, in fishing up from the greatest depth of the North Atlantic the broken end of the cable. Herr Siemens was born in [illegible] at [illegible], in [illegible].

Mr. Lewis Williams, M.E., of Pontypridd, whose death is announced at the age of 54, was a son of the late Mr. W. Williams, of Coedcae, one of the pioneers on the Rhondda coalfield, and was himself identified throughout life with mining operations in various parts of South Wales.

The National Physical Laboratory and its Work.

THE report of the executive committee of the National Physical Laboratory, approved at the annual meeting for presentation to the Royal Society, indicates that progress has been achieved in all directions. In view of the Government Building Grant of £10,000, and a donation of £1,000 by the Goldsmiths' Company, the proposed additions to the Laboratory buildings will be pushed forward as rapidly as possible. The new electrical buildings will, it is anticipated, be opened in June, on the occasion of the visit of the foreign guests of the Institution of Electrical Engineers. The report for the year 1905 shows the extraordinary variety and extent of the operations carried on under the direction of Dr. R. T. Glazebrook, D.Sc., F.R.S., and includes multitudinous details as to the work compiled from the reports of the assistants in the various divisions. The report on the engineering department is appended. We note that the results of the investigation into the resistance of material to alternating stress is nearly ready for publication.

The following paragraph from the report may possibly give a quietus to fears that the Laboratory will conflict with the interests of professional chemists: "The question has been raised during the year of the scope of the work of the Laboratory. An impression prevails in some quarters that the committee are prepared to undertake ordinary routine chemical analyses, and so compete with the work of professional chemists. This impression is a mistaken one. Except for Government work, and in some few special cases which come individually before the committee, chemical analyses are only undertaken when they are required to elucidate some physical or mechanical question under investigation. The Laboratory was founded, in the words of the second conclusion of Lord Rayleigh's committee, as a public institution for 'standardizing and verifying instruments, for testing materials and for the determination of physical constants.' The committee have no wish to interfere with the work of professional chemists, and do not believe that in their conduct of the Laboratory such interference has taken place."

Quite an elaborate programme of work for the present year has been approved by the Board. We quote the following from the section relating to the engineering department: "In the discussion of the sixth report of the Alloys Research Committee at the Institution of Mechanical Engineers in January, 1904, the importance of impact tests as a means of detecting certain qualities in materials not brought out by the ordinary testing methods was generally recognised. At the conclusion of the discussion, several suggestions were made that a research on impact tests should be taken up at the National Physical Laboratory. These opinions were further emphasized on the occasion of the reading of Messrs. Seaton and Jude's paper on 'Impact Testing,' at the Institution of Mechanical Engineers in December, 1904, both in the paper and in the discussion, the general feeling being that these tests should be standardized. Opinions were divided as to the best method of test to adopt, which is a matter of considerable importance, as the agreement between the results of tests made on any given material by different methods of impact testing is not so close as it ought to be. In fact, as was pointed out in the discussion, there appears to be a great deal of work to be done before any complete concordance of results can be hoped for.

"It is proposed, therefore, to commence a research on impact testing during the year 1906 in the engineering department. As regards the method adopted, while recognising the importance of tests to destruction by a single blow both in rapidity and for giving comparative results, there appear to be strong reasons that new work on the subject should take the form of tests by repeated impacts Of these, the chief one is, as pointed out by Mr. Seaton, that in everyday practice accidents are often the effect of a large number of comparatively small blows repeatedly applied and not of one definite shock. Further, as the question of the effect of repeated shock is so intimately connected with that of alternating stresses recently investigated in the Laboratory, it is felt that the opportunity should not be missed of making a comparison of the resistance of the same materials in these two distinctive cases of repeated stress. A machine for the purposes of the research has been designed and is approaching completion. The first set of experiments will be made on notched specimens placed on knife edges, 4½ in. apart, and subjected to repeated blows in the centre. This method has been adopted chiefly on account of the simplicity of the mechanism required to carry out the tests. If consistent results [illegible] obtained in this way it is proposed to modify the machine so that the specimens may be subjected to direct stresses instead of bending stresses.

As regards wind pressure research, it is proposed to complete the observations on the resultant pressure of the wind on rectangular plates of 100 square feet and less in area. The case of the lattice girder model which has been constructed will then be taken, and it is hoped that sufficient data will be obtained from this model to predict the effect of the wind on open frame-work generally. The reason for restricting the number of models employed is the very large number of observations necessary to obtain a reliable value of the mean pressure. From the previous year's work it is estimated that for plates of considerable area, two hundred observations on each are necessary. The reasons for this appear to be: (1) Owing to the position of the Dines Tube being necessarily from 10 to 15 ft. distant from the centre of the plate the wind conditions at the two points vary considerably at any instant, as was evident from Mr. Dines' experiments; (2) the direction of the wind is not always quite normal to the plate, although special precautions are taken to prevent observations being recorded when this is perceptible on the wind vanes.

It is proposed, finally, to attempt the determination of the resultant wind pressure on a roof model, in order to discover if the remarkable suction effects noticed in the experiments on small roof models in a uniform current of air occur in the open air. It is hoped that, with fairly favourable conditions as regards winds of high velocity, the research will be completed during the year.

Further work may be desirable to complete research on the resistance of materials to alternating stress.

When the report on the work hitherto accomplished in connection with the steam research has been completed it will be a matter for discussion in which direction to advance next, whether by modification of the apparatus to attempt to secure greater accuracy in the determination of the specific heat, or to investigate more fully the relation between pressure and temperature at high temperatures.

The Engineering Department.

Report on the Department for the Year ending December 31st, 1905, made by the Superintendent (Dr. T. E. Stanton) to the Director (Dr. R. T. Glazebrook).

Commercial Testing.

The testing [illegible] has [illegible] increased during the year. A special machine has been constructed in the workshop for testing pressure gauges under forced vibrations of varying period and amplitude. This consists of a crank [illegible] mechanism, the gauge under test [illegible] and the crank pin fixed to a rotating disc which is provided with a device for varying the stroke.

A special hot chamber has been fitted to the low-pressure gauge testing set for the purpose of testing gauges at varying temperatures. The temperature is regulated by a series of [illegible] to circulate the hot air.

A machine for testing materials under reepated impacts has been designed and is nearly completed. The striking tup is actuated by a cam worked through a reduction gear from a small motor, and is designed to give, approximately [illegible] blows per [illegible].

Owing to the demand for [illegible] Young's modulus for samples of steel tapes, the 10-ton testing machine has been fitted with a special standard carrying microscope holders so as to enable observations to be taken on lengths of three or four feet. A high-pressure pump, made by Messrs. Hayward, Tyler and Co., has been put down for water pressure tests up to five tons per square inch. By this means [illegible] tests on carbonic acid cylinders up to the bursting pressure have been satisfactorily carried out.

The one-ton single lever testing machine for testing specimens in tension and compression, alternately, has been completed, and has been further improved by attaching a hydraulic cylinder provided with a four-way cock to the bed plate so that a finer and better adjustment of the load can be made than by the screw and hand-wheel first adopted.

Owing to the demand for tests under higher steam pressures, the apparatus for testing the value of steam pipe coverings has been improved by having the flanges welded to the experimental pipes, and by the provision of stronger fittings throughout.

RESEARCH WORK.

Dr. Stanton and Mr. Bairstow.

The Effect of Wind Pressure on Structures.

The work during the year has been mainly confined to making observations on the resultant wind pressure on two rectangular plates, one 10 ft. by 10 ft. and the other 10 ft. by 5 ft. The method adopted has been that alluded to in the previous year's report, *i.e.*, of taking simultaneous observations of the velocity head of the wind and the resultant pressure on the plate. Owing to the very considerable differences in wind pressure which are known to exist even in a steady breeze at points distant 10 ft. or more apart, it has been found necessary to take a very large number of observations in order to obtain a reliable mean result. The number of observations made on the large board has been, approximately, 150, and for the smaller board, 100, and it is considered that within the limits of wind velocity available during the year, these are sufficient to justify a mean being taken for speeds up to 25 miles per hour, but for speeds greater than this a sufficient number of observations are still lacking. The experimental data already obtained appear to indicate that for the same wind velocity the mean intensity of pressure is the same for a board of 100 sq. ft., as for a board of 50 sq. ft., and, further, that the value of the constant does not differ greatly from that obtained from experiments on small models in a uniform current of air.

Owing to the abnormal quietness of the atmospheric conditions in the Teddington district during the present year, opportunities for making observations have been exceedingly limited, only ten days in the whole year having been suitable for the purpose. It is hoped that, with more favourable conditions, the research will be concluded during the coming year.

The Resistance of Materials Under Alternating Stresses.

(Dr. Stanton and Mr. Bairstow.)

This work has continued throughout the year, and a research on the resistance of certain qualities of iron and steel in common use by engineers has been completed. Messrs. Belliss and Morcom, of Birmingham, have kindly presented four samples of steel from their stock for the purposes of the work. Two qualities of English wrought iron have been purchased, so that, including the four samples of Swedish material presented by Mr. Hadfield in 1904, an investigation has been made of the properties of ten samples—seven of steel and three of wrought iron. As it was considered that the experimental conditions should approximate as nearly as possible to those obtaining in actual practice, the number of alternations was fixed at 800 per minute, and the ratio of the tensile stress to the compressive stress was 1·4, which is a common value in steam engine practice. Under these conditions, sufficient data have been obtained to determine with tolerable accuracy the limiting range of stress for one million reversals in each of the ten qualities of materials tested.

In these tests the form of the specimen has been such that the maximum range of stress was obtained, but as it is often impossible in practice to design machine details of such form as to secure the maximum resistance, an investigation has also been made of the corresponding ranges of stress for weaker forms.

The three forms adopted were :—

(1) Specimens with screw threads cut on them.
(2) Specimens having a sudden change of section.
(3) Specimens having a fairly rapid change of section.

Definite results have been obtained in all these cases.

A microscopical investigation has also been made of the gradual development of the "slip-bands" of Ewing and Rosenhain in a specimen under test. The results obtained confirm those of Ewing and Humfrey, who traced the gradual development of cracks in the specimens from slip lines in the case of specimens subject to alternate bending. This method, which has hitherto been [illegible] extended to the more difficult cases of moderately high carbon steels.

The concluding part of this research was the determination of the limiting range of stress (at the same speed) in cases in which the tensile and compressive stresses were nearly equal in amount. For this purpose a new crankshaft of small throw was fitted to the machine, which did not require any further modification for the purpose.

Tests on Pressure Gauges.

(Dr. Stanton and Mr. Bairstow.)

The proposed tests on pressure gauges, suggested in the report for 1904, have been carried out, and a full report of the tests communicated to the director. Ten gauges were submitted for testing purposes by the makers, and were subjected to tests to determine the effect of friction, backlash, temperature, and vibration, together with endurance tests. The vibration tests were made at three different periods and amplitudes of vibration. Of the gauges tested, one was balanced and the remaining nine were unbalanced. The vibration tests showed that considerable disturbance of the gauge pointer was produced in the case of all the unbalanced gauges, and that the balanced gauge was practically unaffected in all cases. The results of the other tests [illegible] quality.

Steam Research.

(Mr. Jakeman.)

The experimental determination of the specific heat of superheated steam has been continued during the past year, and the apparatus has been improved in several details. The steam is now thoroughly dried by passing through a gas-heated superheater before being used for the experiment. The initial superheat in this superheater can be varied from a few degrees only, up to 150 deg. C. or more. The steam is then heated a further 20 deg. in the electrically heated superheater, and the specific heat calculated is the mean for these 20 deg. The specific heat so obtained is taken as the specific heat at the mean temperature. The radiation loss has been rendered much more constant by enclosing the apparatus in an air-tight screen. Notwithstanding these improvements, it was not found possible to obtain consistent results with experiments lasting from 15 to 20 minutes, even after allowing several hours for the apparatus to settle into a steady condition. It has, however, been found that if observations be taken very frequently for periods of 100 minutes after three to four hours' preliminary heating, the results obtained agree very fairly well; the maximum variation between similar determinations not exceeding 2 per cent. The need for this long period of observation, of course, renders the research somewhat tedious; as, to determine completely one value of the specific heat, requires two complete sets of observations and a long period between them for readjusting the current and flow of steam. This makes a very full day's work. The experiments have proceeded steadily during the last month, and five points [illegible] atmospheres, one point at 7 atmospheres, and one point at 9 atmospheres. The results obtained are fairly consistent, and it is hoped to publish them in detail very shortly.

[illegible] the curve at 4 atmospheres will be first settled more closely by several more determinations, and the observa- [illegible] the curve produced by increasing the pressure. The reliability of the methods appears to be settled now beyond doubt; but, probably, it will be necessary to reconstruct the apparatus to obtain an accuracy closer than 2 per cent., and to provide a means of completing the determinations more quickly.

Work Done by the Workshop Staff.

The chief items of work undertaken and carried out by the workshop staff during the year have been :—

The preparation of specimens for the alternating stress research.

The preparation of specimens for the copper-aluminium alloys research.

The machining, fitting and erecting of the large comparator for the Metrological Department.

The correction of five leading screws in the standard lathe.*

The construction of appliances for measuring the pitch of threads in nuts.

The construction of a machine for testing materials under repeated impacts.

The construction of pressure gauges for the wind pressure experiments.

The repair and upkeep of the laboratory plant.

Lighting and Heating Department.

The three experimental batteries have continued in good working order throughout the year. The state of the lighting battery has been unsatisfactory; many of the pellets in the negative plates have become loose and show a tendency to drop out. The accumulation of deposit was such that in December it was necessary to remove it, and this was satisfactorily done without disconnecting the cells. It is hoped that, with careful attention, the battery will not require any outlay upon it for the present, although the capacity is reduced.

The provision of the new Lancashire boiler, which is now in course of erection, will enable the operations of cleaning and scaling to be done with greater regularity than was possible before, and should lead to more economical working. The demand for electrical energy during the year has increased to such an extent that it has been found necessary to run the steam turbine daily.

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* [illegible]

Water Power Plants in Europe and America.

The marked divergence in water power practice as developed on the Continent and in America is well brought out in Mr. John Wolf Thurso's new work on modern turbines,* the shortcomings of American turbines being emphasised in a manner that should give American hydraulic engineers food for reflection for some time to come. We are reminded that of all European countries Switzerland, having many excellent water powers, and producing no coal whatever, ranks highest in progressive turbine building, being followed closely by Germany, Austria, and Italy. France, although the native country of the turbine, and rich in water powers, has advanced little during the last ten years, except that some builders are closely copying American turbines, such as the Hercules. In describing the principal features of present European practice the author assures us that European builders have brought out and perfected a number of turbine types, which have enabled them to meet any reasonable conditions and to predetermine and guarantee a high efficiency in all cases.

The development of the turbine in the United States has been solely by experiment, and has differed entirely from that in Europe. For low heads, say up to about 40 ft., the author considers that the American type has a great advantage over all other turbine types in common use in giving the greatest number of revolutions for a given head and power developed, or the greatest power for a given head and diameter of runner. It is, however, little adapted to high heads, and, apart from this, the shape of the runner, as now generally used, has some features which violate the rules to be observed for obtaining a high efficiency. On seeking the causes of this deficiency, we find it attributed chiefly to the purchaser, who "generally believes that water power costs little or nothing, and that any turbine which will turn his machinery is good enough." In another place it is remarked that "the general cry for cheapness and the striving to meet competition by reducing the cost of production seem to have done more harm in the manufacture of turbines than in most other lines."

The author deals briefly with turbine pumps, remarking that the reversed turbine or turbine centrifugal pump, like the turbine itself, was evolved by theoretical investigations. He illustrates some interesting quadruple turbine pumps recently built by Sulzer Brothers, Winterthur, Switzerland. Each of the pumps has four fan wheels, in one case arranged in series. The first fan wheel discharges into the suction of the second one, and so on, the water successively passing through all wheels. These fan wheels have a diameter of 20 in., and with 890 revs., deliver 1,010 U.S. gals. of water per minute against a head of 428 ft., which is equal to 107 ft. of head for a pump with single fan-wheel, and give an efficiency of 76 per cent.—certainly a great advance in the construction of centrifugal pumps. The author adds that, though the turbine pump is only of recent date, it is safe to predict that its efficiency will be brought up to that of the turbine, viz., 80 to 82 per cent., at least, for heads up to 1000 ft.

The general characteristics and properties and the advantages and disadvantages of the different classes of turbines having been described, the author proceeds to consider the turbine types best adapted to the different heads. A chapter on the steam turbine is included, by reason of its close relation to the hydraulic turbine, and another on turbine accessories deals successively with the draft tube, stop valves, throttling gates, and gauges. A good deal of attention is given to the important question of governors and speed regulation. The second part of the volume is devoted to data concerning turbine plants, largely based upon the author's personal experience.

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* [illegible] Water Power Plants. By John Wolf [illegible] Ltd.

Our Weekly Biography.

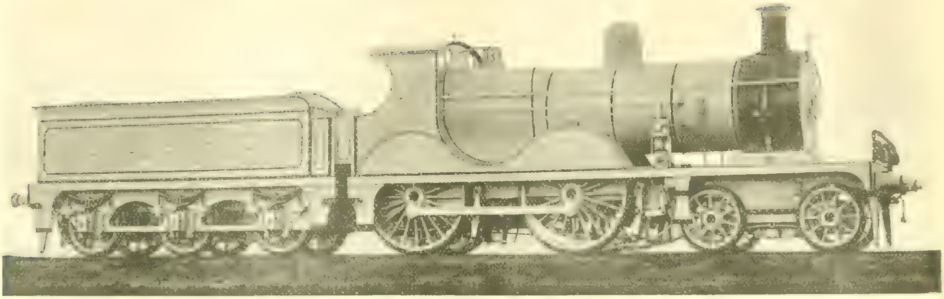
Professor Stanley Dunkerley, D.Sc., M.Inst.C.E., M.I.Mech.E., Asso.Inst.N.A.

PROFESSOR S. DUNKERLEY was born at Burnley in 1870. At the age of sixteen he entered Owens College, Manchester, and in 1889 graduated B.Sc. with first-class honours in mathematics, and the following year secured a like distinction in engineering. Upon the completion of his university course he spent some time in gaining practical experience in the works connected with the construction of the Manchester Ship Canal. In 1892 he returned to the academic life. He was elected Berkeley Fellow of Owens College, and, later, senior assistant lecturer at the Liverpool University College. While occupying this position he was responsible for lectures to honours students, besides having charge of the drawing office and the steam laboratory. Four years later he became demonstrator at Cambridge under Professor Ewing. Here he gave university lectures on mechanism and surveying, and had charge of the shops, mechanical steam and hydraulic laboratories, the drawing office and the practical surveying class.

STANLEY DUNKERLEY [illegible]

In September, 1897, on the retirement of Professor Cotterill, Dr. Dunkerley was invited to become a candidate for the chair of applied mechanics at the Royal Naval College, Greenwich. The work at this institution was to a considerable extent of a post graduate character, the officers attending the lectures being picked men from the engineers and constructors, and also advanced gunnery and torpedo lieutenants. At the time of Professor Dunkerley's appointment there was no engineering laboratory of any kind at Greenwich. Three years later, on the recommendation of Professor Ewing, the new Director of Naval Education, the Admiralty decided to build a steam and material testing laboratory. This project was superintended by Dr. Dunkerley, and, under the Director of Naval Education, he was responsible for the arrangements and equipments until autumn last year. The laboratory contains a well equipped repairing shop which is electrically driven, a Babcock and Wilcox boiler of marine type to work at 280 pressure and generate 4,000 pressure under forced draught; a superheater to work—at 700 deg. F., a W[illegible] Foster boiler, [illegible] exclusively arranged for oil fuel; induced draught plant; a Parsons steam turbine and a Belliss high-speed enclosed engine, working with same condenser; De Laval steam turbine with condensing plant; a five-ton and a hundred-ton testing machine; a cross breaking machine; a complete outfit for delicate elasticity tests and a Zeiss microscopic outfit. All the auxiliary machinery, feed pumps, induced fan and air pumps are electrically driven. Professor Dunkerley spent two years in this department and looked forward with keen anticipation to the time when all the machines could be tested. But an important chair was vacated in Manchester, and he found it impossible to resist the temptation to return to his old *alma mater*. In succession to Dr. Osborne Reynolds he was appointed professor of engineering and director of the Whitworth Laboratory in the Manchester University. Already he has initiated a number of changes; the regulations of Honours Degree of B.Sc. in engineering he has entirely altered; a student can specialise in civil, mechanical, or electrical engineering in his third year, but every student has to attend, in addition to mathematics and science subjects (or applied electricity, two years of general engineering, including work in the laboratory and drawing office.

Professor Dunkerley is the [illegible] a [illegible] dealing with the kinematics of machines. One of his first papers to attract attention was that on the whirling and vibration of shafts, read before the Royal Society in 1894; this was followed by a second paper on the same subject read before the Liverpool Engineering Society in 1896. These were followed in 1902 by a paper on the straining action in crank-shafts, read before the Institution of Naval Architects. This paper dealt graphically with the character of straining actions, the twisting and bending moments on the different parts of the shaft and pins, the modifications due to weight and inertia of moving parts, the effect of continuity of shaft. For this contribution to technical literature the Council of the Institution of Naval Architects awarded Professor Dunkerley a gold medal.



NEW TYPE OF EXPRESS LOCOMOTIVE.—SOUTH-EASTERN AND CHATHAM RAILWAY.

Institution of Naval Architects.

Mr. R. W. Dana, secretary, has issued the following programme of the forthcoming meetings of the Institution of Naval Architects :—

WEDNESDAY, APRIL 4TH.

Morning meeting at 12 o'clock :—Annual Report of Council; election of the president, officers and council; election of new members, associate members, associates, and students; appointment of scrutineers for the next annual meeting; address by the chairman, the Right Hon. the Earl of Glasgow, G.C.M.G., LL.D.; presentation of the Gold Medal to Mr. W. W. Marriner, and of premiums to Mr. J. H. Heck and Mr. Harold Yarrow.

The following papers will then be read and discussed: —"The New Scouts," by Admiral C. C. P. Fitzgerald, Associate Member of Council; "Vessels Constructed for Service in Our Colonies and Protectorates," by Sir Edward J. Reed, K.C.B., F.R.S., Honorary Vice-President.

THURSDAY, APRIL 5TH.

Morning meeting at 12 o'clock :—"Yacht Racing Measurement Rules and the International Conference," by R. E. Froude, Esq., F.R.S., Honorary Vice-President; "The Speed of Motor Boats and their Rating for Racing Purposes," by Linton Hope, Esq., Associate; "The Design and Construction of High Speed Motor Boats," By James A. Smith, Esq., Member.

Evening meeting, at 7.30 o'clock :—"Gas Engines for Ship Propulsion," by J. E. Thornycroft, Esq., Associate; "The Efficiency of Surface Condensers," by Professor R. L. Weighton, Member.

FRIDAY, APRIL 6TH.

Morning meeting, at 12 o'clock :—"Notes on the Freeboard Rules," by J. Foster King, Esq., Member; "The Overhead Wire Cableway Applied to Shipbuilding," by J. L. Twaddell, Esq., Member; "The Introduction of Cranes in Shipyards," by Alexander Murray, Esq., Member.

Evening meeting, at 7.30 o'clock :—"Oil Tight Work in Ships of Light Construction," by Herbert Rowell, Esq., Member; "Steam Yachts: Some Comparisons," by J. R. Barnett, Esq., Member.

The annual dinner of the Institution will be held on Wednesday, April 4th, in the Grand Hall, Hotel Cecil, Strand, W.C., at 7.30 p.m.

New Express Locomotives for the South-Eastern and Chatham Railway.

Five express locomotives of a new type have recently been constructed at Ashford Works, to the designs of Mr. Harry S. Wainwright, chief locomotive engineer. These engines have coupled wheels 6 ft. 6 in. in diameter, as compared with 6 ft. 8 in. wheels in the previous design of express engine, and the fire-box adopted is of the "Belpaire" type, which is very easy to maintain, and gives more heating surface, increased steam space, and a better circulation of water, thus preventing sediment collecting on the crown of the box.

The engine and tender complete are longer than the previous express engines, and most of the bearing springs are fitted with rubber attachments to absorb vibration. The engine cab is very roomy, and has four windows. The roof is fitted with a sliding ventilator, and a special fire-guard is fixed near the fire-doors, so as to shield the enginemen from the glow of the fire.

The steam reversing gear has Mr. Wainwright's device of rods, working in tubes to simplify the number of parts, and is fitted up in the latest improved style, and the whole of the cab fittings have been arranged, with a view to accessibility. The engines are fitted with steam heating apparatus, so that they can be used upon express and boat trains, upon which train-warming arrangements have been adopted. The first of these engines has already undergone successful trials.

A Board of Trade report issued last week shows the activity of railway, canal, electricity, gas, water, and other companies which are being spurred by enterprise or competition to seek extended powers in Parliament. The total number of Bills deposited for the Session of 1906 relating to these matters is 151, as compared with 131 for the Session of 1905. The total amount of money proposed to be raised is £57,949,511, as compared with £47,470,914, an increase of £10,478,597. The Bills of existing railway companies number forty-one, and show a length of ninety-eight miles and new capital to the extent of £6,743,331. Those of new companies number eleven, giving a length of 197 miles, and capital to be raised to the amount of £25,201,000.

Duplex Combined Boring, Planing and Facing Machine.

By Miley's Machine Tool Company, Ltd., Keighley.

THE machine illustrated has been specially designed for operating on portable engine cylinders. It will bore the two cylinders, face the ends, plane the outside seatings and inside slide valve seatings at one setting, the positive disc stroke being a special feature on account of the fine clearances for tools.

The planer upright is connected to disc by means of a cross-piece, which is lined with hardened steel plates for disc bolt, the upright being adjustable lengthwise on the cross-piece to alter position of stroke, to suit the varying sizes of cylinder. The planer heads are moved closer in to suit the smaller cylinders, by means of screw at end of base plate.

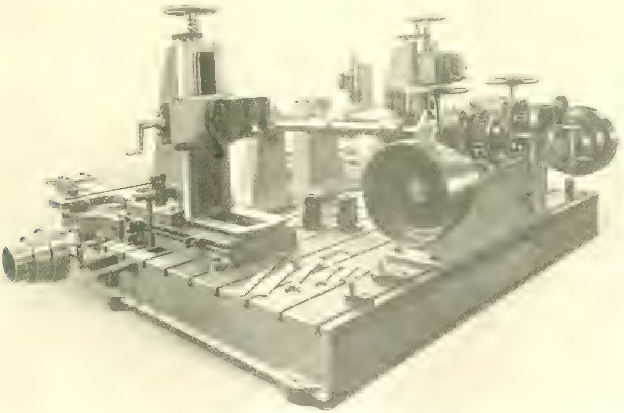
The self-acting feed motion for planer uprights is worked by means of cogs and catch-lever, connected by level wheels to a vertical shaft in upright, which gives motion to a vertical screw and shaft for vertical and horizontal feeds, each being fitted with a clutch at top of upright, for putting on and releasing the feed.

The disc-plate is 27 in. diameter, enclosed in case, with hollow-faced worm wheel, running in oil, the cross-piece being supported on disc and cap bearing at back of machine.

The two planing heads (right and left hand) are each [illegible] × 3½ in. face, through worm and large worm wheel, revolving the disc-plate. The maximum stroke is 22 in. The tool box has a vertical self-acting feed of 24 in. There are two adjustable boring heads, fitted with 3 in. and 5 in. diameter bars, boring heads and facing arms, the minimum centres of bars being 11½ in., with a maximum of 22 in. The range of holes varies between 5 in. minimum and 23 in. maximum.

The machine is driven by three-speed cone, 12 in. to 18 in. diameter, by 5 in. face, through mild steel worm and gun-metal machine cut-worm wheel running in oil trough. The borer-feed motion has forged-steel gears, with weight and lever at end of bars. Steel rules are let into beds for positioning the boring heads. The facing arms are self-acted by tappets carried in brackets bolted to the bed. A set of extra bushes is supplied to suit the 3 in. bars, for fitting the heads of the 5 in. bar, so as to allow of *two* 3 in. bars being used for smaller cylinders.

The gears are machine cut. The machine is supplied with two-speeded counter shafts. The floor space occupied [illegible]



DUPLEX COMBINED BORING, [illegible] FACING MACHINE.

Portable Electric Tools and their Industrial Applications.

By Andrew Stewart, A.M.I.E.E.

THE earliest portable electric tools, as far as the writer can ascertain, were due to Dr. Werner Siemens, about the year 1879, when he patented in Germany a percussive drill for use in coal and other mines. This tool was subsequently abandoned because of the difficulties which were found in practice, and a tool in which the stroke was purely mechanical, being caused by a strong spring acting against a continuous rotary motor substituted. This drill has been developed, and is at present largely used in Germany and the United States of America. The most extensive example of the application of these rock drills is at the Karrawanken Tunnel in the Styrian Alps, Austria, where a large number of drills of a similar type have been used for rock drilling during construction.

Tools of any kind where the motion is communicated to the operating mechanism by means of a flexible shaft possess many disadvantages. They are not portable in the ordinary sense of the word, and the apparatus consists of more parts than are either necessary or desirable, though up to the present, with the exception of the Marvin percussive drill, no satisfactory percussive tool has so far been designed, and as such rock-drills do not come within the scope of this paper, they will not be referred to.

Tools with telescopic or flexible shafts have an undoubted disadvantage. This is not so apparent in mining or quarrying as it is in shipyards and general engineering, where it is necessary to use the tools in awkward positions, and where telescopic or flexible shafts may interfere with the work of other men in the immediate vicinity; moreover, they occupy an amount of floor space out of proportion to their usefulness, and the development of such tools is really a confession on the part of the designer that he has failed to produce a satisfactory self-contained tool, which may be made more efficient, more convenient, and always, by reason of the two foregoing considerations, the more desirable piece of apparatus. For this reason designers have always been striving after tools which have the motor an integral part of the machine.

At this stage it would be as well to refer to the early efforts of Mr. F. J. Rowan, who some ten years ago, in Messrs. Denny's shipbuilding yard and elsewhere, set to work a number of well-designed self-contained electric drills which did excellent service, and proved to a very large extent the superiority of the self-contained tool over any other. The fact that their application did not spread so rapidly as might have been, was due largely to the fact that at that time not many shipyards had electric power, and that the machines were relatively heavy when compared with pneumatic tools, which subsequently began to play an important part in the industries for which the Clyde is so justly famed. Since then the development of portable tools has been continuous, and while the compressed air tool has for a considerable part of this time played a most important part in industrial progress, the fact that most shipbuilding yards now have electric power installations, has to a very large extent helped the progress of the electric tool; because, while most works also have compressed air, there are many departments where recent developments have shown how useful portable tools would be, yet there is no supply of compressed air available, hence recourse is naturally had to the electric supply, which, if not used for power, is at any rate used for lighting, and it naturally occurs to the works manager that electric power, if suitable tools are available, is eminently suited to his purpose.

The demand for portable electric tools has led many people to place such tools on the market within the last year or two, and at the present time there are several portable electric tools, chiefly of German manufacture, on the British market. These are sometimes indifferent tools, from a mechanical point of view; indeed, it seems that designers have not hitherto combined the requisite mechanical and electrical knowledge, though in most cases failure on the electrical side of the design has been most conspicuous.

Considerations Involved in Design.

In any electrical machine the output is limited by the properties of the materials used in construction. We can go on loading the machine until a point is reached where something happens. That something is generally a failure of the electrical parts, for long before mechanical failure occurs some of the materials used for electrical purposes fail to perform their proper function, and we get the pyrotechnic display so delightful to the eye of the apprentice always on the lookout for something to relieve the drab monotony of his day's work, and enable him to spend a few minutes watching the removal of the disabled tool to the repair shop, or the scrap heap, as the case may be.

The most usual failure is the insulation, for, as the load on the machine grows, so also do the internal losses, and as you cannot waste energy, but only transform it into something else, in this particular case into heat, we have the problem of getting rid of the heat so generated. This is influenced by the linear dimensions of the motor, which should therefore be as great as possible, though this is undesirable; on the other hand, with a temperature rise sufficiently low to enable the tool to be handled with comfort, only a small amount of heat can be radiated, hence we are surrounded with opposing considerations, because convenience demand small dimensions and light weight, while low temperatures and stability of the insulating material demand an increase of the radiating surface by a considerable amount.

The insulating material used is generally a compromise. No material embodies all that is essential to a satisfactory insulator, viz., that it shall be unaffected by moisture, heat, or mechanical strains, and chemically stable under wide ranges of temperature. It is here that most of the failures of the past have occurred, for a pronounced tendency to smoke has always been a prominent feature of electrical apparatus of this description, and this trait, undesirable as it undoubtedly is, when accompanied by the "shocking" effects no less common with some classes of electrical apparatus, makes the designers' difficulties greater than might be imagined.

Influence of Temperature on Output.

With a view to keeping down the rise of temperature, and therefore the linear dimensions, for the latter is a result of the former in the case of electrical machinery, it is a well-known rule among designers that the fixed losses in any electric motor, subject to a variable load, shall be relatively small in relation to the variable losses, because the average losses fix the temperature, and these will be less the lower the fixed losses become. For instance, it is possible to design an electric motor in which the losses would be distributed in either of the following ways :—

TABLE I

		Example A Horse Power	Example B Horse Power
Losses Variable	Brush losses	.02	.03
	Armature copper loss	.4	.65
	Series field loss	.08	.07
Fixed	Shunt field loss	.05	.04
	Bearings, friction and iron losses	.45	.21
	Sum of fixed losses	.5	.25
	Sum of variable losses	.5	.75
	Total losses	1.0	1.0
	Energy input to motor	3 H.P.	3 H.P.
	Efficiency	67 per cent.	67 per cent.

The efficiency of both machines are the same, yet if machine A is run for half an hour on a fluctuating load where the actual work done is equal only to 15 minutes steady load, the losses will be distributed as follows :—

TABLE II.—Machine A

Fixed losses...	.5 × 30 mins.	15	horse-power min.
Variable losses,	.5 × 15 ,,	7.5	,,
Total for 30 mins. working, ...		22·5	,, ,,

and for Machine B.

Fixed losses..	.25 × 30 mins.	7.5	,,
Variable losses. ...	·75 × 15 ,,	11·3	,,
Total for 30 mins. working, ...		18·8	,, ,,

The average losses in half an hour's work with the two machines differ by 20 per cent., though at first sight there ought to be no difference at all if only the efficiencies of the machines are taken into consideration. A machine designed on the lines of Example A, working on a varying load would be less likely to last as long as the machine Example B, for its temperature would be higher, and the molecular changes which take place in certain kinds of insulation when subjected to changes of temperature, especially when the maximum temperature [illegible] ultimately ruin it, hence the question of depreciation of the tool is influenced by the care exercised by the [illegible].

Gearing.

The question of gearing the motor to the drill spindle is equally important, and the writer's firm, after lengthy experiments, decided to adopt a gear which had rendered satisfactory service with the Boyer air drill. The efficiency of this type of gearing is so good that a reduction of 48 to 1 can be obtained with an efficiency of 92 per cent. Of course, the workmanship of such a gear is of the highest order, as it is only by such means that such an efficiency is possible. It represents the fruits of years of experience with air drills, and is one reason for the remarkable success which has been achieved by the Consolidated Pneumatic Tool Co., Ltd., both with pneumatic and electric tools.

Gearless Tools.

As is well known, several firms in this country sell a German tool, the smaller sizes of which have no gearing. Such a practice is permissible for small tools where the armature runs at 1,600 revolutions per minute or thereby; indeed, one may use such tools for drilling holes up to ¼ in. diameter, but it will be found that, notwithstanding the fact that the gearing has been eliminated, no corresponding advantage in the matter of efficiency has been obtained, because a slower and larger motor has been substituted with no corresponding improvement in efficiency, and it is likely that such a machine would be found less efficient than a well-designed geared machine.

Speed and Output.

The higher the speed the smaller are the linear dimensions of a motor required to produce a given power, while the fixed losses, which are largely due to hysteresis and eddy currents in the armature iron, are proportional to the amount of iron, the speed, and, approximately, to the density of the magnetic induction. It is apparent, therefore, that as the latter is fixed by the design, and may be constant, any alteration of the first two which follows from an increase in speed, increases one in the proportion that it reduces the other, but the output grows with the speed, within certain limits, hence, although the losses in the high-speed machines are no greater, the output is increased, so that the ratio of losses to output is less than before, in other words, the efficiency is greater.

Forced Ventilation.

The most important limiting factor with these motors is heating; sparking at the commutator, while a factor, does not impose any limit before the heating becomes excessive, indeed, by careful design the influence of sparking may be eliminated, and that due to heating only remains. Here, due to the ingenuity of Mr. W. O. Duntley, Vice-President of the Chicago Pneumatic Tool Co., a novel method of getting over the difficulty was introduced into their portable electric tools, and one [illegible] of a small four-blade fan on the armature spindle sufficient air is blown through the armature, where quite [illegible] keep it cool. The result of such an arrangement is that [illegible]

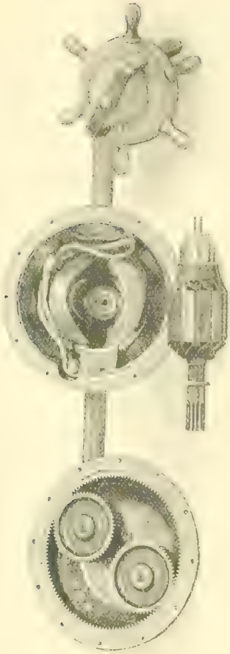


FIG. 1. ELECTRIC DRILL TAKEN TO PIECES—ARMATURE AND GEAR.

varying load, owing to the [illegible] burning [illegible] the insulation, the same machine with the fan had a rise of temperature of only 110 deg. F. at the hottest part, after four hours' run on a varying load such as drilling holes.

These fans consume very little power. Careful tests show a consumption of 1-60th to 1-70th of horse-power, but, notwithstanding this small power, the fan is effective enough in keeping the machine cool.

Air cooling is, of course, not unknown in electrical machinery. Many European induction motors have small vanes on the edge of the rotor to cause a current of air to blow on the stator winding; air blast transformers have been used for years, and the motors on the Metropolitan and North-Eastern Railway electric locomotives, to mention only two instances of air cooling, which i effected by fans driven from small motors which blow air through the main motors, but the use of a fan on the motor shaft of small drills has not hitherto been employed, and it seems a very satisfactory way of getting over one of the limiting factors which the designer has to face.

A drill taken to pieces displaying the gearing is shown in fig. 1. The small fan is mounted on the shaft close by the pinion, though in some cases, particularly the three armature drills, which will be afterwards described, the fan is at the commutator end. The construction can be examined more closely by an inspection of the actual tool. Fig. 2 is a section through the motor, and gives a good general idea of the arrangement.

Three Armatures in One Field.

A feature of the larger tools made by the Consolidated Pneumatic Tool Co., Ltd., is the use of three armatures running in a common field, the general arrangement of the motor of which will be apparent from fig. 3. This type presents the outstanding advantage of utilising every available bit of space in the machine; even the small space at the centre can be used to take the feed screw.

This remarkable design has been criticised by many, but the chief feature of the criticism is the inability of the critics to demonstrate that any alternative they propose is superior to the three-armature machine, and, as most people know, and those who don't will soon learn, a negative policy is no use either in engineering or anything else. With such a design an important reduction in the weight is obtained over that of a single armature machine, while the linear dimensions can also be reduced because of the more efficient utilisation of the space. This will be apparent from a comparison of figs. 2 and 3, the first of which shows a much larger percentage of a waste space than fig. 3.

These advantages are clear from Table III., which shows the relative weights of the essential parts of a three armature and a single armature drill.

In each case the non-magnetic parts were of aluminium as far as possible. The slight disadvantage under which the three armature drill labours by having three sets of brush gear and additional leads reduces the ratio of the active material to total weight.

The pinions of the three armatures gear into a spur wheel, which has a pinion on the same shaft, the subsequent reduction being by a gear similar to that shown in fig. 1.

Breast Drills.

As is well known, breast drills were among the earliest types of portable drill produced, and there are now a large number of such tools in use, though many have not proved conspicuously reliable; indeed, the mortality

TABLE III.

[illegible] B.H.P. motors for electric drills.

	Single Armature.	Three armatures.
Armature	7 lbs.	10.85 lbs. (3 armatures)
Field (including winding)	30 lbs.	19.5
Total, ...	37 lbs.	30.35 lbs.
Weight of machine,	60 lbs.	58 lbs.
Ratio of active material to total weight, ...	.62	.525

among [illegible] has often led to the high voltage [illegible] they are operated being blamed. While, of course, small armatures of, say, 2 in. or thereby are difficult to wind. there is no reason why they should not prove reliable. That these insulation troubles are not confined to breast drills is evident from the fact that one of the largest shipbuilding firms in the world who employ portable electric tools to a large extent have special 100-volt mains to supply these tools, so that this difficulty is removed.

It is hardly necessary to say that with 500 volts such tools become nearly impossible, indeed, even if practicable, the fact that a defect in the insulation would be accompanied by results too shocking to contemplate, makes them undesirable under any circumstances.

As the drill spindle runs at a fairly high speed, the gearing is simple, and in many cases gearless machines are used, but that involves comparatively slow speed motors, which are not only heavy but inefficient, as has been shown, and the adoption of much higher speeds than practicable with gearless machines, and the introduction of a well-made gear is easily justified on the score of efficiency and reliability.

Large Portable Tools.

When we come to large tools, the necessity of gearing is recognised by all, but opinions seem to differ as to the extent to which gears should be used. A large ratio of reduction can, in most cases, be justified on the score of efficiency and light weight, as the weight of an increased gearing is not as great as the increase in the weight of a slower speed motor. Some interesting figures (Table IV.) will make this clear, as it shows the speed, weight and efficiency of a standard motor, a light-weight automobile electric power, and a special drilling machine by the Consolidated Pneumatic Tool Co., Ltd.

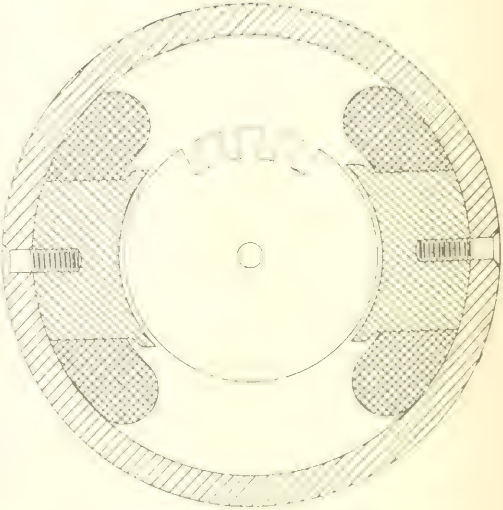
TABLE IV.

	Intermittent Rating Standard	Intermittent Rating Special	Electric Automobile Motor	[illegible]
B.H.P., ...	$1\frac{3}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	[illegible]
Speed, ...	1700	2700	2000	[illegible]
Efficiency, ...	70%	69%	69%	71%
Weight, ...	156lb	132lb	90lb	[illegible]

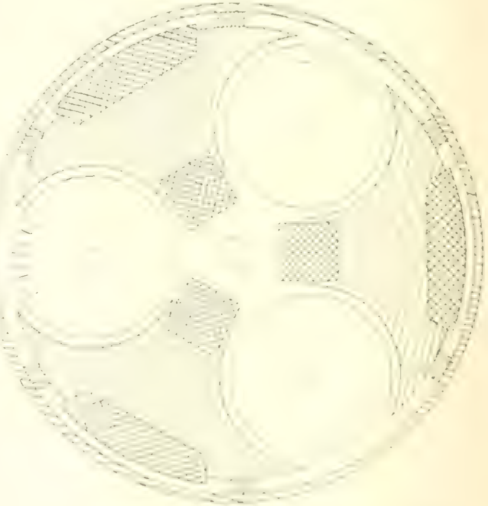
* Including gear reducing to [illegible] Rev.

Note.—Automobile motor has end plates of aluminium.

As a matter of fact, the machine marked "Special" is on the verge of impracticability, as the variable losses, *i.e.*, losses which grow as the square of the current, have become so great that the machine has passed the limit at which it can be kept cool without difficulty on loads where the periods of rest equal the periods of work, neither exceeding a few minutes, which is the usual interpretation of term, "intermittent rating," such as is usual for cranes, hoists, etc. The electric automobile motor is also based on the usual traction rating and in practice it derives considerable advantage from the fact that it is exposed to a current of air and so radiation takes place rapidly; moreover, the machine has really a larger radiating surface than its weight implies, for the



[illegible]



[illegible]

use of aluminium, wherever possible, reduces the weight with no corresponding reduction in the linear dimensions, and therefore in radiating surface.

The electric tool, on the other hand, is capable of doing a good deal more than the first two motors, as it will do satisfactory service where the periods of work are of the order of three or four times the periods of rest, obviously a remarkable performance for the electric tool, and a striking testimony to the many excellent features of the design. The motor and gearing used on the larger tools is similar to that illustrated (fig. 1), except that in two cases, that of tools for 1¼ in. and 2½ in., three motor drills are made as well as single motor tools.

Magnetic Drilling Pillars.

Drilling pillars are usually fixed by bolts and nuts in the desired position, but the use of a magnet in the base of the pillar as a substitute for the bolts and nuts possesses so many obvious advantages that its use is inevitable. To fix a pillar by merely turning a switch is practically an instantaneous operation, while the fixing of the same drill post by means of bolts and nuts presents so many opportunities to the workman to carry out his great plan of so little work for so much money, that its practical extinction would not be regretted except by the workman, who in a given time would drill at least twice as many holes as formerly.

The design of such posts and the considerations involved in the production of a cheap and efficient type of magnet led the authors years ago to adopt the concentric type of magnet for somewhat similar purposes, and when it became necessary to design magnets for holding down these drill pillars this type suggested itself, not only on account of economy, but because it was the only type which gave good mechanical protection to the windings. One must not leave human nature out of account in engineering design, and the fact that there is nothing like labour-saving tools for rousing the animosity of democracy, must be kept in view. A magnet which has the windings exposed must run the risk of being booted off a scaffold as frequently as possible, such accidents being among the ordinary risks of all labour-saving apparatus. The advantage of iron-clad magnets is that when booted it generally wins, and even the most unreasoning opponent of labour-saving apparatus does not willingly repeat the experiment.

The tenacity with which a magnet sticks to anything is roughly proportional to the square of the density of the magnetic induction, hence exciting power is of more importance than mere area of iron, and those magnets where the contact area is increased by the addition of a pole shoe to increase the area at the point of contact, show that the designers forget that the principles which apply to the design of dynamo magnets must be reversed, so far as the air gap is concerned, when applied to magnets for lifting or pulling purposes.

Moreover, owing to the short air gaps in such magnets the permeability of the steel which forms the magnetic circuit plays a much more important part in the performance of the magnet than is the case with electrical

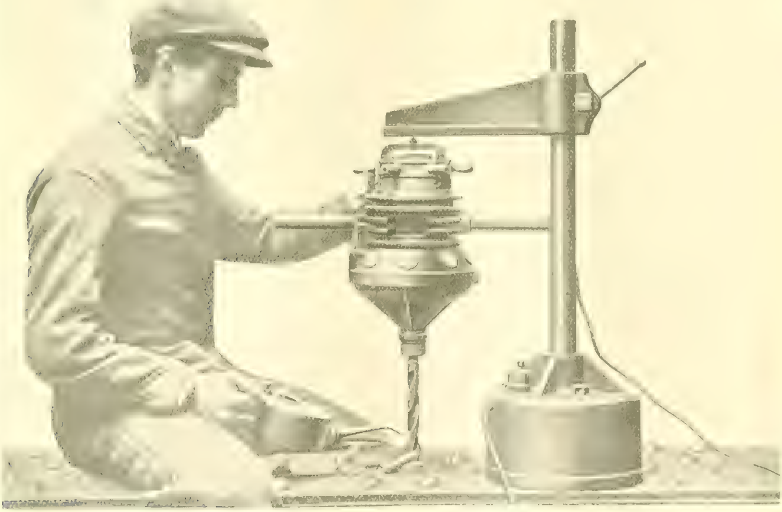
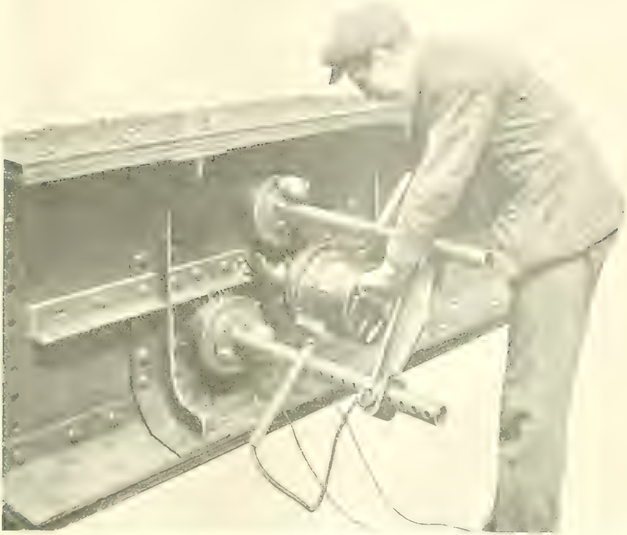


FIG. 1.—SINGLE MAGNETIC DRILL POST IN USE.



[illegible]

machinery, and the writer has sometimes obtained very erratic results, variations of the order of 30 to 45 per cent. in the pull of two exactly similar magnets having been noticed, hence the chemical composition and physical process through which the steel passes must be carefully considered if uniformly satisfactory results are to be obtained; for instance, a magnet which was designed to give a pull of $1\frac{1}{2}$ tons, and weighed 47 lb. with the exciting coil, was found to give this pull, but other magnets, duplicates of this, gave pulls of 1·65 and ·94 tons respectively. This was found to be due entirely to the steel which formed the magnetic circuit of the magnet, which must be carefully chosen if the high flux densities which are essential to light weight magnets are to be obtained.

A single magnetic drill post is illustrated (fig. 4). This post is suitable for tools drilling up to $\frac{3}{4}$ in. or $\frac{7}{8}$ in. holes, and the post itself only weighs 62 lb. It will be seen that such a combination presents several remarkable features. It may be taken apart from the drill to facilitate transport, and the two may be used separately if desired. When the combination is complete, as shown, it has almost all the advantages of a radial drill; the supporting arm can be raised, lowered, or swung round to any position. A tool of this kind, when used on a bridge or a ship's deck, is almost invaluable.

For large holes a double post is employed. These can be designed to give pulls of the order of four tons or thereby, and will hold down against drills cutting $2\frac{1}{2}$ in. or 3 in. holes.

[illegible] make these holding-down magnets more suitable for use on irregular surfaces, the writer some time ago designed magnets with movable cores which would adjust themselves to variations of the surfaces to which they were attached, and so avoid the diminution of pulling power which takes place when the magnet face does not make proper contact with the surface to which it is to be attached.

Fig. 5B shows this double drill post in use drilling a bridge girder. In order to demonstrate the tenacity with which this magnet holds to the girder, the magnets were stuck on to the girder, and the workman who had been drilling the hole then sat on the upper drilling post with his feet supported by the lower post, and held the drill on his knee (see p. 712). The total weight was about 100 lb., acting on nearly the full length of the drill post.

[illegible]

The Efficiency of Small Electric Tools.

Having shown how many considerations enter into the design of a satisfactory electric drill, and how the Con- [illegible] various difficulties which appeared in some cases insurmountable, it is now necessary to demonstrate the efficiency of these machines.

Proposed Experiments with Automatic Couplings.

In the House last week Mr. Bell (Derby) asked the President of the Board of Trade if he would take an early opportunity of appointing a statutory committee, representing the railway companies, Board of Trade, and railway employees to examine and select automatic couplings and either-side brakes for railway trucks, and arrange for experiments with such couplings and brakes, in accordance with section 15, sub-sections 1, 2, and 3 of the Railway Employment (Prevention of Accidents) Act, 1900, with a view to their adoption. Mr. Lloyd-George said that steps would be taken to set up such a committee at an early date, and he hoped it might be possible to constitute it somewhat in the manner suggested. Mr. Bell asked if the President would consider the possibility of enabling the committee to practically test designs submitted by railway employees, who necessarily had the best knowledge of them? Mr. Lloyd-George said this was the object of the committee. He had the sanction of the Treasury to expend a certain sum of [illegible] [illegible] proposed experiments.

Manufacturers and Technical Education.

At a meeting of the West Ham Education Committee it was reported that the Municipal Technical Institute Committee had held a conference with representatives of the various manufacturers and employers of labour in the borough on the question of specialising the technical education given in West Ham, with a view to meeting the needs of its particular interests and industries. The firms represented were the Great Eastern Railway Company, the Thames Ironworks (Limited), the Vinolia Company (Limited), the British Alizarine Company, and ten private firms. On behalf of the committee it was suggested that employers might help by advice as to courses of study, by enabling expert workers in special trades to give instruction to day-course students, by allowing employees to take a short course of day theoretical instruction at the institute, by engaging those who had gone through a full approved day course, and by allowing teachers and students to visit the works. Suggestions were also made as to allowing special facilities to employees who attended the evening classes. On behalf of the masters it was stated that at present it was impossible to allow employees to attend the day classes, but that great benefits had been derived from the evening classes.

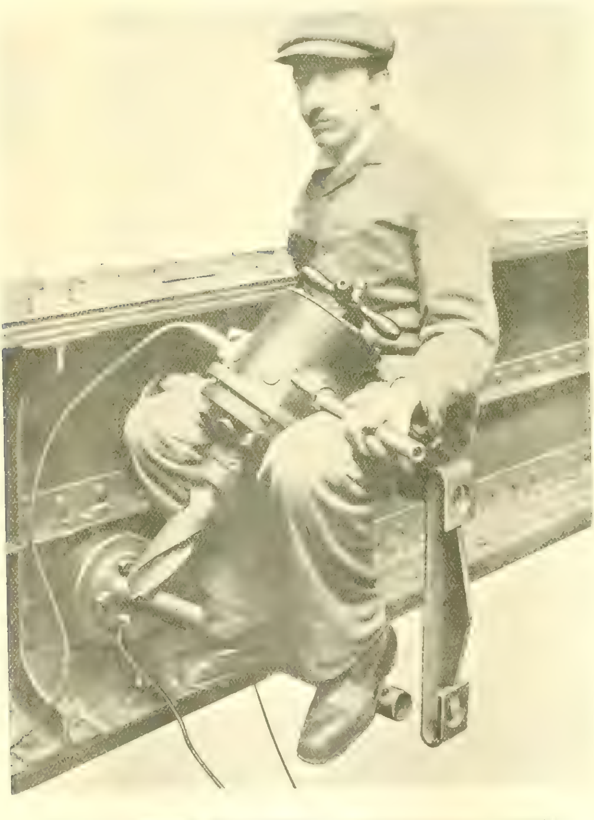


FIG. 5C. MAGNETIC DRILL POSTS: A DEMONSTRATION OF TENACITY.

At a conference of postal telegraph clerks, held last week, the question of the introduction of 3d. telegrams was again mooted. It was then urged that with the present rate the number of telegrams despatched was practically stationary, while there were large numbers of people unable to make the use they would like of the telegraph system, and reference was made to the "unfair competition" of telephones. On the other hand, it was contended that the 3d. telegram would not benefit the masses, and that the people who employed telegrams could afford to pay for them. A suggestion in the nature of compromise was that there should be 3d. rate for local areas, with the present tariff for long distances.

Attention having been called to the unsatisfactory procedure in connection with the registration of trade marks in the United States from the point of view of British trade-mark owners, and the desirability of alterations being made in the existing rules, the council of the London Chamber of Commerce have referred the matter to their trade-marks section for consideration and a report.

Our Review of the Week.

From Our Own Correspondents.

Scotland.

GLASGOW.

The Trade Outlook.

[illegible] during the present month, and this is a sign of the times which is somewhat significant. It is true that the majority of the builders have enough work on hand to keep them engaged for some time to come, but, all the same, a little anxiety is naturally felt as to future work. Ship plates remain at £7 7s. 6d., less the usual 5 per cent. For angles there is stated to have been some underselling on the part of North of England makers, a competition which has the effect of causing steel makers to accept lower prices for small angles and bars. It is pointed out that the malleable iron makers from whom this competition in small sizes emanates, are able to roll from imported semi-manufactured material. Notwithstanding that the warrant market has been off colour in the absence of any speculative demand, Scottish makers have so much work on hand that they are able to disregard temporary fluctuations in the speculative market. Bridge builders are reported to be full of orders, and we have already referred to the order received by Sir William Arroll and Co. for twenty bridges for railway extensions in Egypt.

West of Scotland.

There has been some slight concession of pig iron prices by makers, but the reductions, after all, have been slight, and do not indicate any real giving way on the part of producers. Instead, they appear to be very well off for orders; the demand on foreign account is unusually brisk, and there is every expectation that it will be maintained. Steel makers advise that the inquiry and pressure of delivery for boiler and ship plates is very great, and consumers are paying premiums on list quotations in order to get quick delivery. There is less passing in angles, and merchants are undercutting makers, who still name £6 15s., less 5 per cent., as their selling figure. There is a good inquiry just now for thin steel plates, which are bent and riveted into pipes for [illegible] these in the market. Dealers in black sheets are doing a big trade with East India, China, and Japan. Galvanisers are not so well off again, and thin sheets in consequence are the turn easier in tendency. Wagon builders are very busy, and they are offering for an Egyptian contract for 500 steel wagons, which is pretty certain, it is thought, to come here. Engineers are as well employed as they have been [illegible] tory.

Weekly Wages in the Clyde Shipyards.

[illegible] and engine-shops have been agitating for weekly pay. At present wages are paid fortnightly, and the objection the employers urge against the weekly [illegible] it resulted in a great increase of broken time. [illegible] tion of whether they were prepared to strike for the enforcement of their demands, and the figures were [illegible] voted in favour of striking and 2,728 against, giving [illegible] At the conference the men's officials, after submitting the ballot figures, asked for an immediate answer to the men's request. The employers' representatives, however, claimed the right again to consult the members of their two associations. Ultimately the conference was adjourned, on the understanding that the employers would give a definite answer before the end of April.

Japanese Battleship "Katori."

[illegible] completed at Barrow, will run her trials on her Clyde course. It was intended to send the vessel to Portsmouth Dockyard to be dry-docked, and later to run the speed tests in the English Channel, and it may be accepted as an acknowledgment of the progressive policy of the Clyde Trust in straightening the river and providing large graving-docks that the *Katori*, the most powerful battleship so far completed, will go up the Clyde to the graving-docks at Glasgow. Another and even more significant point is that the vessel, after trial, will go to the naval construction works at Dalmuir of Messrs. William Beardmore and Co., Ltd., to be completed for her voyage to the Far East, instead of returning to Barrow-in-Furness. It is true that practically nothing remains to be done except to clean and paint the ship, but the arrangement is, as the Glasgow Herald points out, one more evidence of the close association of the Vickers and Beardmore Companies.

Proposed Tube Combine.

[illegible] by the proposed combine for the British tube trade. The last issue of the Economist, dealing with the proposal, states that for some time back negotiations have been in progress for effecting a selling-price [illegible] were not keeping to [illegible] the bargain, and the arrangement broke down. Since then the fiercest competition has raged, and prices were last autumn cut down to the lowest points probably ever recorded in the history of the trade; and this in the face of a great and growing demand for material. Prices only recovered late in 1905 by the sheer force of circumstances—the inability of producers to meet demand and the willingness of buyers to pay more money than was asked to secure prompt delivery. This brought about a change of tone in the makers' ranks, and led to the consideration whether a new and more solid basis of working could not be fixed up. The proposition met with general approval, and in the course of consultations that followed it gathered weight when it was realised that a combination might be made to work out at a gain on current terms of from 30s. to 40s. a ton.

Conflicting Interests.

But there are two branches in the tube trade, and in endeavouring to reconcile the divergent interests of the home and export sections serious obstacles were encountered, and these have not yet been overcome. There are certain firms which find the main outlet for their productions in the home market, and there are others which depend chiefly on their foreign and colonial connections for trade. No insuperable difficulty showed itself to the negotiators in arranging the terms which should be charged home consumers of tubes, and all seemed to be running smoothly until the large export makers asked for some consideration. In the open market they have to meet the severe competition of America and of Germany, notably that of the former, in addition to that offered by home makers, who there dispose of the balance of their output which the home market cannot absorb. The big export makers, therefore, insisted that the deal should cover both branches of trade, or, on the other hand, that if the foreign trade was to be left an open scramble, they should receive monetary consideration for the support [illegible] prepared to [illegible] keeping up prices at home. They went further, and sounded the American producers as to the attitude they were disposed to take up towards a British combine in foreign markets; and the former are said to have expressed themselves in a favourable sense. It is to be hoped, however, for the sake of British consumers, that the difficulties in the way will prove insurmountable, for an advance in the price of tubes, such as has already been indicated as probable, would have a most serious and retarding [illegible] the development of [illegible] industries.

Underground Cable Completed to Glasgow.

The underground telegraph cable from St. Martin's-le-Grand to Glasgow is now practically completed, and will probably be thrown open for public traffic in the near future. All the material used in the construction of the cable is of British manufacture, and the expenditure involved exceeds £2,000,000.

Institution of Engineers and Shipbuilders.

The competitive designs for the new buildings to be erected at the corner of Elmbank Street and Elmbank Crescent were submitted at a meeting of the Institution of Engineers and Shipbuilders in their hall, Bath Street, last week. In all, fifty-one designs were sent in by architects. From these a short list of four were selected, and of the four that of Mr. John B. Wilson, 92, Bath Street, Glasgow, was accepted as the design from which the new halls and offices should be built. The design of Messrs. Mitchell and Whitelaw, Glasgow, was placed second, and received a premium of £75; that of Mr. H. E. Clifford, Glasgow, third, with a premium of £50; and that of Mr. W. F. M'Gibbon, Glasgow, fourth, with a premium of £25. As designed by Mr. Wilson, the building is estimated to cost about £[illegible]5,000.

North-East Coast.

NEWCASTLE-ON-TYNE.

Middlesbrough Iron Trade.

There is no recovery yet in the speculative prices of pig iron, but otherwise the trade continues in a healthy condition. Shipments of pig iron from Middlesbrough continue large, being about 40,000 tons in excess of last year, and the increase is mainly to foreign markets. Although some iron still continues to be put into store at Middlesbrough, the quantity taken out is larger, and the total has been reduced from 736,412 tons to 733,054 tons in one week. The price of No. 3 Middlesbrough warrants fluctuated between 48s. 8d. and 47s. 2½d., closing at 48s. 1d. Hematite receded from 63s. 3d. to 62s., but has recovered to 63s. 4½d. The severe reaction in speculative prices has had its effect. Buyers no longer show themselves eager to enter the market, feeling uncertain as to whether the bottom has been touched. Under these conditions it is difficult to estimate whether or no the volume of trade is growing or not, but the general belief is that it is. The important question [illegible] ther the consumption of the world can overtake the great increase which has lately taken place. If it can, prices are certain to advance, as they are now comparatively low. It may take some little time before this important question can be answered, and in the meantime the market is likely to be held in a state of suspense until we have more light on this matter. The steel and finished iron trades of this district remain fairly active, and while prices generally have been maintained, steel rails have shown some improvement. The engineering and shipbuilding trades are actively engaged, but new orders are still slow in coming in, consumers being disposed to hold off in the expectation that the market will move in their favour.

Cleveland Iron.

The shipments of pig iron from the Tees have been lower lately, but for the month they are 30,000 tons above those for the corresponding period in the past year. The increase is in both the home and foreign shipments, but [illegible] most marked in the latter. The shipments of manufactured iron and steel this month are also above those for the same period of last year. There has, with the lower shipments of the last few days, been a check to the decrease in the stocks in the warrant stores, but for the month so far the decrease amounts to 11,000 tons.

The Exhibition and Local Industries.

In opening the North-Eastern Counties Electrical Exhibition at Newcastle last Saturday, Sir Isambard Owen made some timely observations as to the growth and needs of local industries. They were, he was told, the largest consumers of electricity per head of population of any part of His Majesty's dominions, perhaps he might say of any part of the world, and that was only the present condition of things. They had heard lately that a great chemical industry was about to establish itself on the banks of the Tyne, and that if that was the case the demand for electrical power would be probably doubled. That was not the only aspect of the subject of electrical machinery to the North of England; on the maintenance of the North of England in the van of electrical progress depended not only the electrical industries of Tyneside, but the staple industry of the whole of the North of England, namely, the production of coal. Some years ago, one might have thought that water power had been permanently and hopelessly distanced by steam power as a prime mover, but the efforts of electrical engineers abroad had brought water power again within measurable distance of its more modern rival. We were, however, holding our own in the matter of steam power. He was informed that electrical power could be produced on Tyneside at as low a rate as it could be produced at the falls of Niagara. He trusted that steam power, for the sake of the North of England, would keep ahead of water power; and that it should do so it was of immense importance that electrical engineering in the North should be kept fully up-to-date and ahead of what was being done elsewhere.

Newcastle Exhibition.

An interesting display of exhibits has been arranged, and the manufacturers of heavier machinery are also well represented. The Sunderland Forge and Engineering Company have working a 15-ton travelling crane, and they are exhibiting ship lighting plant, motors, and winches. Messrs. J. H. Holmes, and H. T. Boothroyd, Hyslop and Co., Ltd., have splendid displays of plant. Coal-cutting machinery is, of course, well in evidence, and on Messrs. Crosier Stephens and Company's stand will be seen a novelty in the way of a water meter for measuring oil and other liquids. This firm also exhibit spraying machines for whitewash, some high-speed machine tools, and other interesting apparatus. The Parker Foundry Co., Brunswick Malleable Iron and Steel Works, Derby, have a fine exhibit of their castings (under the charge of their local representatives, Messrs. Crosier, Stephens and Co., Newcastle-on-Tyne), consisting of connecting rods, crank shafts, valves, forks, levers, a variety of motor-car and wagon castings, and also a number of castings for shipbuilders' use.

Electricity from the coal to the consumer is the subject of one set of exhibits. The processes are shown first by a small coal-pile, and then in succession, a Stirling water-tube boiler in operation, a Parsons' turbo-generator, a high-tension switch-gear design, cables of all types used in distribution, low tension, distributing panels used in sub-stations, service boxes as exist in the public streets, meter arrangements, and house fittings. A turbine with the top removed and showing the blades is an interesting exhibit. Domestic lighting and heating, and the best methods of using electricity for machine tools, are effectively shown by the Newcastle and District Electric Lighting Co., Ltd.

A Floating Crane.

Messrs. Swan, Hunter and Wigham Richardson, Wallsend-on-Tyne, have under construction a floating crane capable of lifting weights up to 140 or 150 tons. The hull of this craft is now at Wallsend, and the crane is being erected. The vessel will be propelled by four screws driven by separate engines. The ballasting arrangements are such as to allow of the heaviest weights being properly and quickly compensated for. As indicating the capacity of the crane, it may be added that it will be capable of placing the 110-ton boilers in the new Cunarder.

The Power Gas Corporation.

This Stockton-on-Tees Company has obtained the contract for the power-gas installation for the shipyard of the China Steam Navigation Co. at Hong Kong. The gas plant is capable of producing 300,000 cub. ft. of gas per hour, 75 per cent. of which will be specially cleaned for use in four gas engines—having a total capacity of 3,300 b.h.p.—and 25 per cent. will be used in furnaces and other heating appliances. As the working conditions require continuous running day and night throughout the year, the plant is designed so that any of the main parts can be isolated without interfering with its operation. The installation includes three producers of the Mond patent type, but it is arranged to allow of future extension. Eastern fuels of a bituminous character are to be used. The engines are of the Cockerill type, by Richardsons, Westgarth and Co., Ltd., and will be direct-coupled to Dick, Kerr dynamos. Messrs. Richardsons, Westgarth, are the principal contractors in connection with the shipyard works.

Richardson's, Westgarth and Co.'s Contracts.

[illegible] obtained in connection with the Hong Kong Shipyard, Messrs. Richardson's, Westgarth, are building two 1,500-h.p. gas engines for the new rolling mills which are being erected at Dumbarton for the Kosmoid Co. The firm is also completing a battery of a dozen [illegible] orders are also in hand for South Wales, including [illegible] a large ventilating fan.

Reconstruction of Tyne Suspension Bridge.

[illegible] traffic of the district, it has been decided that it shall [illegible] recent examination of the bridge revealed but few signs of deterioration. The engineers recommend the renewal of several of the suspension rods and the substitution for the tar macadam roadway by [illegible] measures are probably only of a temporary character, as the bridge is to a great extent unfitted for use by modern traffic, and it is likely that it will be replaced [illegible] new structure.

Yorkshire District.

SHEFFIELD.

Sheffield Trade.

At present there is no indication of slackening in the steel industry. The demand for all kinds, both for home and foreign markets, is well maintained, and a very heavy tonnage is leaving the city. The rolling mills, tilts, and forges are making full time. There is more activity in the engineering branches. In the leading works new plant is being put down and old plant modernised, and every effort is being made to bring things up to date, thereby finding considerable employment. There is no falling off in the calls for files, and there are few houses who are not full of work. The run is very largely on files for use in the engineering, shipbuilding, and kindred trades, and though prices are cut the demand is keeping both men and machinery in activity. There is also more doing in the lighter classes of engineers' tools, and some firms in the edge tool trades are finding their men fuller employment. The steam coal trade holds well up, and despite the fact that the leading pits are working full time stocks are not unduly accumulating. The demand for export purposes generally is steadily increasing. The railway companies and large works are taking an increasing tonnage, and prices are very firm. A brisk trade is being done in all the commoner qualities of fuel. [illegible] ties.

The Forging Press.

The Sheffield Society of Engineers and Metallurgists met at the University on Monday evening to hear a paper by Mr. A. J. Capron, M.I.M.E., on "Forging [illegible] forging presses were looked upon generally as suit- [illegible] of 2,000 tons power and upwards being generally used. The useful speed of working of presses of this size was, to a great extent, limited by the speed with which the forging could be manipulated, ranging generally from ten to twenty-five strokes per [illegible] eighty, strokes a minute, and with such speeds as these, they could compete with hammers for even quite light work, and consequently widen the range of applications for which presses were suitable. He gave the following table as an indication of the power of press suitable for various sizes of ingots, the former figure, the tons, being the power of the press, and the inches the maximum diameter of the ingots: 300 tons, 10 in.; 500 tons, 14 in.; 800 tons, 20 in.; [illegible] 48 in.; 3,000 tons, 60 in.; 4,000 tons, 72 in.

Orders for Rolling Stock.

Previous reference has been made to the renewal of activity in the rolling stock department, and some important orders have been passing through the shops of the Leeds Forge Co. It will be remembered that the firm received a contract for a large number of wagon sets for the Siberian Railway, and the Indian Government has just placed an order for [illegible] lines. Other contracts for abroad include a considerable order for the Egyptian State Railways. The Caledonian Railway Company has just placed a con- [illegible] wagons, to be used for the carriage of heavy steel rails. The wagons will have a length over buffers of 48 ft., and a width of 7 ft. 7½ in. The bodies will [illegible] 34 ft. 2½ in. apart. It is intended that the wagons be used in pairs, and when thus linked they will be capable of carrying a load length of 90 ft.

Hull Dock Extension.

The contract for a deep-water dock at Marfleet, East Hull, has been let to Messrs. S. Pearson and Son, Ltd. The plans provide for a dock of about 52 acres of water space, and for a lock 70 ft. long and 85 ft. wide, with a depth on the sill of 10½ ft. at low water spring tides. The work is to be put in hand immediately, and it is hoped it will be completed in about five years. Arrangements are being made to [illegible]

Lancashire District.

MANCHESTER

The Iron Position.

The iron market remains dull and the price of Lin- [illegible] tions remain nominally as follows:—Lancashire No. 3 foundry, 62s. to 63s.; Lincolnshire, 57s. 6d. to 58s. 6d.; Derbyshire, 61s. 6d. to 62s. 6d.; Staffordshire, 57s.; Middlesbrough, open brands, [illegible] to 74s. 6d.; East Coast ditto, 77s. 10d. Scotch: Gartsherrie, 66s. to 67s.; Glengarnock, 64s.; Eglinton, 62s. 3d.; Dalmellington, 61s. 9d. to 62s. delivered Manchester. Delivered Heysham: Gartsherrie, 64s. to 66s.; Glengarnock, 62s.; Eglinton, 60s. 3d.; Dalmellington, 60s. 3d. Delivered Preston: Gartsherrie, 65s.; Glengarnock, 63s.; Eglinton, 61s. 3d.; Dalmellington, 60s. 9d. In finished iron the tone [illegible]

[illegible] well engaged; locomotive builders are steadily employed, there is a good demand for structural material, and the machine tool trade remains active.

Barrow Iron.

[illegible] quiet mark[illegible] experienced, and sales are few, while the volume of business is limited. Makers are not quoting in many cases, but warrant iron is steady at 63s. 9d. net cash sellers, buyers 3d. less Stocks are comparatively high, being over 79,000 tons, but most of this metal is firmly held, as it is believed by general makers that a revival will soon set in. It is expected that if prices get down to 60s. a fuller demand will spring up for steel rails, orders for which have been held back for some time. The steel mills are well employed on plates, and only half employed on rails and merchant sorts. Engineers are well employed, except in the marine department.

Dock Scheme at Liverpool.

A bill to empower the Mersey Docks and Harbour Board to provide additional dock and other accom[illegible] cost of [illegible] £4,5[illegible] has pass[illegible] the House [illegible] Lords. [illegible] proposed at the north or Bootle end of Liverpool to construct two entrances from the river, 130 ft. wide and 40 ft. deep—the largest dock entrances in the world. These will give access to a half-tide dock, and this again to two great docks. There is also to be an entrance from the half-tide dock to the existing harbour dock, and provision is to be made at the other end of entrances to docks that may in future be constructed still further to the north. The bill also empowers the Board to enclose large portions of the foreshore at Seaforth by means of an embankment, the Board anticipating that even before the docks now projected are completed further extension may be necessary.

A Vickers Branch at Manchester.

Following the rumours of Cammell's new branch in [illegible] that it is probable that in the not distant future the firm of Vickers, Sons and Maxim, shipbuilders and engineers, of Sheffield and Barrow-in-Furness, will establish a branch of their great engineering industrial business in Manchester. At present it is too early to say that a particular scheme has been decided upon, but the idea is that works shall be taken in Manchester, not far from the Ship Canal, for the manufacture of electrical equipments and the development generally of an electrical engineering business, as a part of the business of the company. Messrs. Vickers, Sons, and Maxim may make their entry into Manchester either by way of establishing entirely new works or by amalgamating with or absorbing a business of magnitude already established in excellently-equipped premises. The second course is, granted that circumstances favour the undertaking, most likely to be undertaken. An electrical engineering works of their town would be a very serviceable adjunct to the armour-plate and gun-making works at Sheffield, to the shipbuilding yards at Barrow, and to the rapidly extending business of the Wolseley motor-car works at Birming[illegible]

A Vickers' Cruiser for Peru.

[illegible] on Tuesday from the Naval Construction Works of Messrs. Vickers, Son and Maxim, at Barrow, by her Excellency Senora Clotilde A. de Condamo. With the exceptionally high speed of 24 knots, she carries a considerable armament, including two weapons firing a 100 lb. projectile, effective against unarmoured craft at three miles range, and, in addition, there are eight 14-pounder guns and eight 1¼-pounders, weapons that are very destructive against torpedo craft. She has also tubes for firing torpedoes under the water-line. The vessel is 370 ft. long, and only 3,200 tons displacement, the draught being limited to enable her to enter all South American harbours. She will have 300 officers and men. A sister vessel for Peru is in an advanced state of construction at Vickers' works.

The Midlands.

BIRMINGHAM.

Birmingham Iron Trade Meeting.

A dull tone was in evidence at the last meeting of this association, and the attempt to maintain prices has for the present been given up, except in the case of a few sellers of Northamptonshire iron, who continue to ask 60s. for forge qualities. In spite of the depression which prevailed there was a decidedly hopeful undertone, to which the improvement in the North of England trade contributed in no slight degree. It is realised, too, that stocks on hand are very low, and an improvement in demand at an early date appears inevitable. Even in finished iron there is little activity, and the competition of Belgian makers is still an important factor of the situation, as even if little Belgian iron is bought consumers are encouraged to believe that by pursuing a waiting policy they may obtain further concessions as the result of this competition. The black sheet trade is very quiet and prices are about 2s. 6d. lower than they were a week since, and even these prices are not representative of actual conditions, as it is perfectly certain that some firms would accept less than the minimum quoted in order to do business. Many of the mills are working very short time. Rolled steel sections are a firm spot. The annual meeting of the South Staffordshire Ironmasters' Association has been held, when Mr. G. Macpherson was re-elected chairman. The fact that the galvanisers, at their recent meeting, decided not to make any alteration in the standard for corrugated sheets occasioned not a little surprise, but it should be pointed out that if the home trade is somewhat dull, the shipping [illegible]

The Engineering Position.

There is still abnormal activity in the cycle trade and in the motor manufacturing industry, while in the [illegible] the announcement of the intention of the Government to dispose of the Royal Small Arms factory at Sparkbrook to a private company. The general engineering trades in the Midlands appear to be well employed, a number of good orders having been recently placed with the heavy iron founders, while the railway rolling stock makers have some large contracts under execution. The general engineers are well engaged, and makers of electrical machinery are working full time on current orders, while new contracts are coming in at a satisfactory rate. Makers of steam pumps for mining and irrigation purposes report a good foreign trade. The common bar iron manufacturers find business rather slow, and uncertainty prevails in the black sheet trade. In the branded bars and hoops department a fair amount of business is offering on account of home government departments.

Weighbridges for Ceylon.

The Ceylon Government R[illegible] have just placed an order with Messrs. W. and T. Avery, Ltd., Soho Foundry, Birmingham, for a weighbridge of special time-saving construction, consisting of two separate platforms, and patent combination arrangement, so that small trucks can be weighed on the one platform and large bogie trucks on the two platforms combined. The weighing is automatically recorded. In addition to the above the weighing platform for the small truck is fitted with patent lead on rails, so that a train of small trucks can be weighed without stopping. The enormous saving in time resulting from weighing trains in motion is apparent. The total capacity of the weighbridge is 60 tons, and the two platforms are 16 ft. and 12 ft. long respectively, each being fitted with steel rails to the Ceylon Government Railway gauge, viz., 5 ft. 6 in. The weighbridges are self-contained and of improved three-lever type, which allows the platform to swing in the direction in which the traffic moves, and avoids all torsional stress. This time-saving arrangement should prove a great advantage to railway officials, especially in handl[illegible] congested centres.

Bridge Engineering at Aston.

A [illegible] operation [illegible] engineering circles was brought to a successful conclusion at Aston a few days ago. A new iron girder bridge was substituted for the old Ten Arches brick bridge which was erected seventy years ago, and carried the Sutton Coldfield and South Staffordshire branch of the London and North-Western Railway across Lichfield Road. The new bridge, which is constructed of steel girders and concrete, has a clear span of 59 ft. 9 in., with a headway of 16 ft. 6 in., and for the convenience of the work it was being built about 30 ft. from the old structure. The bridge, when ready for placing in position, rested on four six-wheeled trolleys, each fitted with two fifty-ton hydraulic rams. The first foot was covered in 31 2-5 seconds, and in about sixteen minutes those responsible for the work had the satisfaction of seeing the new bridge in its proper position. This portion of the work had been done by means of steel winches, and the bridge was then lowered by hydraulic pressure on to the bed-plates, to which it was next permanently fixed.

The Hornsby Paraffin Motor.

In view of the interest being taken in the development of the paraffin motor for marine, and more particularly for Admiralty requirements, it is interesting to note that Messrs. Hornsby's, of Grantham, are making a series of trials with an engine of their own construction. Figures are not available at the time of writing, but the results of the trials are stated to have been [illegible] satisfactory.

Works Removed to Lincoln.

It is announced that Messrs. H. J. West and Co., of Stamford Works, Southwark, have purchased the engineering works lately belonging to Messrs. J. R. Richardson and Co., Ltd., at Saxilby, near Lincoln. Messrs. West have, in addition, purchased some 13½ acres of land, and, we understand, have already submitted plans to the borough surveyor for a very large extension to the existing works. The new wor[illegible] to be equipped with the [illegible] plant.

South of England.

Bituminous Coal Gas Power Plant.

In connection with the Swanscombe Works of the Associated Portland Cement Co., Ltd., the Masons Gas Power Co., Ltd., have received instructions to proceed with the erection of a 2,400-b.h.p. bituminous coal gas power plant required to work in connection with seven Oechelhauser gas engines of 350 b.h.p. each. The gas plant will consist of three gas generators, each of 800 b.h.p., with the necessary cooling and cleaning plant. It is considered that the successful results obtained on the 1,800-b.h.p. plant at the works of the Reading Electric Supply Co., Ltd., formed a large factor in aiding the Masons Gas Power Co. to secure this important contract.

Great Central and Great Western New Lines.

On Saturday last your correspondent was afforded an opportunity, by the courtesy of the Tramways and Light Railways Association, of inspecting the new joint line of the Great Central and Great Western Railways. The new line runs by way of Ruislip, Gerrards Cross, Beaconsfield, High Wycombe, and Princes Risborough, joining the existing Great Central main line at Grendon Underwood Junction. The new line has a double purpose. Not only will it, from April 2nd, provide the Great Central with an alternative road into London, but, when the Ashenden-Aynho section has been completed, it will shorten the distance between London and Birmingham b[illegible] and give the Great Western an [illegible] the [illegible] capital of the Midlands. The connections with the existing system of the Great Central are now completed, and the whole line will be thrown open for through traffic North at an early date. By this enterprise, the Great Central, for the first time since its entry into London, has the opportunity of building up a suburban traffic, and in addition it can compete on more favourable terms with the older trunk lines to the Midlands and North. When fast passenger traffic is put in operation over the new route, which has been specially constructed for high-speed running, there is certain to be a reduction in [illegible]

Stothert and Pitt, Ltd.

This Bath firm has a large amount of work going through the shops. They are constructing a large number of electric cranes on patented "free barrel" system; amongst others the equipment of the new harbour at Fishguard, a further order for the Cardiff Railway Company, and for the River Wear Commissioners, also the equipment of cranes for the Bristol Docks, and large installations for Mexico. The firm has also in hand several Aldridge and Fiddes patent retort charging machines. The machines are used for discharging and charging gas retorts, and a report from Liverpool Gas Works states that a considerable saving has been effected in the cost of charging the retorts. Amongst other work in the shops, mention may be made of the large graving dock penstocks for the Admiralty Docks extension at Keyham, and also for the new dockyard at Simon's Bay, and we illustrate on page 681 a large door for one of the special quadruple penstocks at Keyham. A contract approaching completion is a 33-ton steam Titan for the Madras Harbour Board, which we also illustrate in this issue. The machines are intended for lifting loads of 33 tons at 80 ft. radius. They are constructed on the firm's standard design for this class of machine. The main beams are of the cantilever type. The roller path is 24 ft. diameter, and the machine runs upon twelve central flanged steel-tyred wheels. Besides the cargo cranes, men- [illegible] electric jib crane is under construction. The crane will be fitted with a cradle for carrying a railway wagon weighing about 21 tons. Besides the lifting motion, it is fitted with an auxiliary barrel for tipping the railway wagon. It will have a radius of 35 ft. 9 in., and the jib head pulley will be 46 ft. 6 in. above the ground level. A further extension to the works has been found necessary, a new machine [illegible]

Anchor-testing Machine for Devonport Dockyard.

A new machine for testing anchor and cable chains is about to be fixed at Devonport Dockyard. Owing to the increase in the displacement of warships there has been a development in the size of anchors and of their cables. Formerly cables rarely exceeded 2⅜ in. in diameter, but it is necessary now to provide them of 2¹⁵⁄₁₆ in., and larger sizes up to 3 in. The new machine, which has been made by Messrs. Greenwood and Batley, of Leeds, will be capable of exerting a maximum pressure of 250 tons, as against about [illegible]

Oil Motors.

Messrs. Vosper, of Portsmouth, to whose work previous reference has been made, have fitted their 80-h.p. paraffin motor to a 40-ft. Admiralty pinnace. It is of the standard Vosper 80-h.p. pattern, having four cylinders cast in pairs and in one piece with the upper half of the crank case, the camshaft being outside. A small single-cylinder auxiliary motor is fitted for starting, this motor working an air-compressor, which pumps air in a large tank up to a pressure of about 80 lb. per square inch, amply sufficient to start up the main engine. A very complete system of forced lubrication is installed, actuated by a pump driven off the camshaft. The cylinders are of cast iron, and provided with very large water jackets, having large clearing and inspection doors on one side. The water from the cylinders is taken to the exhaust, which is most efficiently cooled. The firm also have in hand a 25-h.p. motor for the Argentine Government.

Wales.

SWANSEA.

Trade of the District.

At Swansea an active dock trade has been in evidence, and there have been heavy shipments of coal to foreign ports. With regard to the tinplate trade, whilst the price of block tin has again improved, prices of tinplates on the metal market have further fallen, and, as it is impossible to manufacture tinplates profitably at current quotations, there is a growing belief that the only course open will be to shut down, and reduce the make to a point which will stimulate quotations and put them back again to a remunerative level. At Cardiff the steam coal [illegible] and at the time of writing there is little sign of easier conditions being seen in the immediate future. In sympathy with the rise in steam coal, the dry coal trade is improving, and the demand for smalls has been more active. Monmouthshire semi-bituminous is a firm market, but the coke trade is weaker. In the finished iron and steel trades, however, little activity is in evidence at the moment in the shape of new business, but the majority of the shops are well engaged on old contracts.

Electrical Equipment of Collieries.

The work now being carried out on behalf of the [illegible]

The generator, with [illegible] kw., is of the revolving field type, built by the Lahmeyer Electrical Co. [illegible] generates 3-phase current at [illegible] volts and [illegible] cycles per second. It is separately excited by a 50 kw. Bellis engine and Johnson and Phillips's generator at 220 volts. Dialite cables are laid in troughing and filled over with bitumen from the generating station to a switch house at the pit head; and down the shaft the cables are placed in three-grooved wood casing. The engines, which are of the Sulzer cross-compound condensing type, are fitted with drop valves with automatic cut-off, actuated by a powerful and sensitive governor, and are recognised as an excellent type of engine for colliery work. They are capable of exerting 2,900 h.p., and are guaranteed not to vary more than 4 per cent. in speed from full to no load. The condensers are of the jet type, placed underneath the engines, driven off the main stage, and guaranteed to give a vacuum of 27 in., with injection at 70 deg. F. The steam is generated in four Babcock and Wilcox boilers with superheaters, at a pressure of 160 lb. per square inch, and the steam is further superheated in a Wilkinson separately fired superheater to a final temperature of 482 deg. F.

Rail Motor Service.

Considerable alertness is manifested at the several ports in reference to various schemes for "tapping" more especially the Monmouthshire districts, and a noteworthy feature of the position has been the inauguration by the Great Western Railway Company of a rail motor-car service between Merthyr and Newport, *via* Risca, shortening the distance to 26 miles and giving express connection at Newport with London, Gloucester, and Bristol expresses. Much importance is attached to this service by the Merthyr Chamber of Trade, prominent Newport traders, and the leading officials of the Great Western Railway.

Germany and Welsh Coal.

Negotiations are stated to have been concluded for the purchase of two anthracite collieries in the Gwendraeth Valley by a powerful German syndicate. The collieries are situated in the Kidwelly district, and it is well known that the owners were approached some weeks ago. Nothing has been allowed to transpire as to the purchase price.

Cray Waterworks.

The Cray Waterworks, in Brecknockshire, are now practically completed, water having been impounded for the first time last week. The work has been in progress some years, and will be finally completed in about two months time. The expenditure up to the present reaches £520,000, and it is estimated that another £20,000 will be required. The area of gathering ground of the new reservoir is 2,680 acres, and the maximum daily rainfall is 3.70 in. Floods exceed 300 million gallons. The reservoir will hold 1,000,000,000 gallons, while the area of the reservoir's water surface is 100 acres, and the depth of water at the dam 100 ft. No fewer than three million and a-half bricks have been used for facing purposes, and a similar number in the tunnel. The tunnel for delivering the water to Swansea is nearly three miles long. The water thence passes to a gauge basin, where screens are provided, and then enters on its journey through a main 25½ miles long to Swansea.

Latest Wills.

S[illegible] COMMODORE TOM WILSON, aged [illegible], of 177, Kingsley Road, Liverpool, marine engineer, and Commodore of the White Star Line, in which service he spent over thirty-one years. He was one of the best-known marine engineers on the Atlantic [illegible] £[illegible],317

P[illegible], aged 74, [illegible] Gardens, London, N.W. £[illegible],370

BEDDOW, EDWIN, of 72, Park Road, Southport, formerly of the Chestnuts, Normanton Road, Derby, a director of the Newstead Colliery Co., Ltd., the Park Gate Iron and Steel Co., Ltd., and the Staveley Coal and Iron Co., Ltd. £[illegible]

WILSON, JOHN, aged 77, of Hillhead House, Glasgow, M.P. for the Govan District of Lanarkshire for nearly twelve years, head of the firm of John Wilson and Sons, merchants, iron tube manufacturers, and brass founders, and of John Wilson and Sons, Vulcan Works, Johnstone, also head of Messrs. Thomas Robertson and Co., of M[illegible], Canada £[illegible]

Obituary.

The death is announced of MR. JOSEPH AIRD, the brother of Sir John Aird, Bart., and an engineer responsible for the introduction of a number of notable improvements connected with the manufacture of tubes.

MR. MARK MARKLAND, whose death at the advanced age of 86 has occurred at Peterborough, commenced his connection with railways at Preston in 1828, and was over sixty years in the service of the Midland Railway Company, being forty-five years locomotive superintendent at Peterborough. He was a contemporary of George Stephenson.

MR. SAMUEL JAMES BOTT, a member of the North Staffordshire Institute of Mining and Mechanical Engineers, and well-known in mining circles, has died at his residence, May Bank, Lawton. Mr. Bott came to the district upwards of twenty years ago as underground manager at a Chesterton colliery. Afterwards he became connected with the Stafford Coal and Iron Company, Great Fenton, and he had acted as the representative of this colliery for a long period.

Advices from New York report the death of Captain PENGILLY, who attained some eminence in Lake Superior copper mining. Captain Pengilly, who was born in Cornwall, went to Vermilion Range, U.S.A., in 1888, and took charge of the Chandler Mine. In 1904 he resigned his position and retired to a farm in Minnesota.

Contractors' News.

For particulars of other contracts, see recent issues of "Page's Weekly," and small advertisements, pages 6 and 7.
We shall be pleased to insert under this column, free of charge, particulars of open contracts. While every care is taken to ensure the correctness of the information given, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies.

Contracts Open.

United Kingdom.

Belfast.—Enlargement of a cast-iron water-tank at Ormeau-avenue Baths, and alternative tenders for the erection of a new tank. City Surveyor's Office .. [illegible]

Belfast.—Coal and ash conveying plant, bunkers and chain-grate stokers .. .. April [illegible]

Brixham.—Supply, delivery, and laying of about 4½ miles of 7-in. and 5-in. cast-iron water mains, together with the requisite sluice valves, air valves, meter, washouts, and other fittings, the construction of a service reservoir, boundary walls, meter-house and store for the Urban District Council. Mr. Fred. William Vanstone, Palace Chambers, Paignton . April 6

Bromley (Kent).—Supply and fitting of hot-water apparatus at the workhouse. Farnborough, Kent, for the Guardians of Bromley Union. Union Offices, Park House, Bromley, Kent .. .. April

Chapmanslade.—Construction of a small service reservoir, and the providing and laying of 971 lineal yards of 3 in. and 4,078 lineal yards of 2 in. cast-iron mains, with valves, fittings, etc., for works of water supply for the village of Chapmanslade, Wilts, for the Warminster and Westbury and Whorwellsdown Rural District Council. Mr. W. H. Stanley, A.M.Inst.C.E., engineer for the Councils, Market House Chambers, Trowbridge [illegible]

Chester.—Construction, alteration, electrical and general equipment of tramways, and new length of track in car shed. Mr. J. H. Dickson, Town Clerk .. .. [illegible]

Dover.—Supply of one rectangular-pattern surface condenser and one Edwards air pump, with requisite valves, for the Corporation. Mr. L. W. Woodman, Electricity Works, Park-street, Dover .. [illegible]

Glasgow.—Stores and fuel for the tramways department. Mr. J. Dalrymple, general manager, 46, Bath Ssreet . April 4

Great Yarmouth.—For the following, for the Great Yarmouth Board of Guardians: (Contract No. 1) a water-softening plant; (2) gas engine and pumps. Mr. W. J. Carpenter, A.M.I.C.E., South Denes Road, Great Yarmouth .. [illegible]

Greetland. — Construction of bacteriological tanks, filters, carriers, and other appurtenant works at Greetland, for the Greetland Urban District Council. Messrs. R. E. W. Berrington and Son, Bank Buildings, Wolverhampton Mar. 31

Hackney (London) Council want tenders by 4 p.m., for construction of condensing water supply works. . [illegible]

Haslemere [illegible] socket pipes, together with a number of sluice valves, air valves, hydrants, etc., for the Hambleton Rural District Council. Messrs. R. B. Grantham and Son, 23, Northumberland Avenue, London W.C. April

Hitcham.—Digging the trench and laying about 1,950 yards of cast-iron water main, 3 in. diameter, with valves and hydrants; also for the construction of a small concrete reservoir at Hitcham, Suffolk, for the Cosford Rural District Council. Mr. Alfred Newman, [illegible]

Leeds.—Tenders for one or two sets of electric generating and condensing plant, each comprising a steam turbine, two-phase alternator and exciter of 3,000 kw. capacity, electrically driven surface-condensing plant, and the necessary pipes and valves. Mr. Harold Dickinson, 1, Whitehall Road, Leeds .. .. April 9

Littlehampton. — Construction of a steel bridge over the River Arun at Littlehampton, [illegible] also for the construction of the approaches and abutments in connection with the bridge, for the Littlehampton Urban District Council. Major Hector Tulloch, C.B., R.E. (retd.), 28, Victoria Street, Westminster, London S.W. April 23

Lockerbie.—Steel and iron work required in the renewal of roof over Dumfries Dock lines at Lockerbie Station, for the Caledonian Railway Company. District Engineer, Princes-[illegible] .. .. .. [illegible]

Loughborough [illegible] required in providing, carting, and laying [illegible] and 3,500 yards of 3-in. cast-iron mains, providing and fixing valves and other fittings, together with building valve and other chambers and other works in connection with the supply of water to Shepshed, for the Loughborough Water Committee. Mr. A. H. Walker, A.M.I.C.E., Town Hall, Loughborough [illegible]

Manchester.—Supply and erection at their hydraulic pumping stations, Whitworth Street, West, and Pott Street, Ancoats, of suitable superheaters, to be fixed in the back down-take of existing Lancashire boilers, also for steam pipes and valves required in connection therewith, for the Waterworks Committee. Secretary, Waterworks Offices, Town [illegible] .. .. [illegible]

Middleton (Lancs.).—Construction of three circular tanks, catchpits, conduits, etc., at their sewage outfall works at Rhodes, for the [illegible]

Last Day.

Norwich. [illegible] supply work at the extensions [illegible] Asylum, Hellesdon, near Norwich. Arthur E. Collins, M.Inst.C.E., Guildhall .. .. .. April [illegible]

Portballintrae. [illegible] Ballymoney Rural District Council. Mr. M'Cormick, engineer, Diamond, Coleraine .. April [illegible]

Reigate. [illegible] the Guardians to submit schemes and estimates in competition for general heating of the workhouse at Earlswood, Redhill. Mr. E. Penfold, A.R.I.B.A., High Street, Reigate .. April [illegible]

Salford. [illegible] generator and condensing plant . April [illegible]

South Shields. [illegible] work embraces the construction of a tunnel, 14 ft. span, togetherwith excavation and concrete retaining walls for railway cutting under Station Road. Mr. S. E. Burgess, M.I.C.E., borough engineer and surveyor, Chapter-row .. .. April 4

St. Neots.—For a steel gasholder tank, also for a spiral-guided gasholder, 50 ft. by 16 ft., to be erected on their works at St. Neots, in place of two existing holders, for the St. Neots Gas and Coke Company. Manager Eynesbury House, St. Neots .. .. April [illegible]

Stoke-on-Trent.—The Corporation invite tenders for electricity meters. Borough Electrical Engineer .. . . .. Mar. 31

Wallesey.—Boilers, 500-kilowatt steam alternator (single-phase), also extensions to electricity works buildings for the Urban District Council .. . .. April 18

Ystradfodwg. — For driving a tunnel (mining only) [illegible] in length, through the Blaenrhondda Mountain, sinking shafts, and constructing works in connection therewith, in the parish of Ystradyfodwg, for the Rhondda Urban District Council. Mr. J. E. Hughes, M.I.C.E., engineer, Tynewydd, Treherbert, Glamorgan .. . April [illegible]

Abroad.

Adelaide.—Supply of the following materials, delivered in bond, on wharf, Port Adelaide, wharfage to be paid by the contractor: 33 best mild steel boiler plates; 19 best mild steel smokebox tube plates for flanging (eight drawings, 1s. each); 10 copper tube plates, flanged (five drawings, [illegible] each); [illegible] solid drawn best toughened copper tubes; 25 solid drawn best copper pipes; 200 volute springs (one drawing, 1s.); 12 best steel straight axle forgings (one drawing, 1s. 6d.); 110 bars channel steel (two drawings, 1s. each); 93 bars angle steel (two drawings, 1s. each); 340 mild steel plates; 150 ft. of iron chain; 300 private locks (one drawing, 1s.); 281 solid drawn-mild steel tubes. Agent-General for South Australia, 28, Bishopsgate Street Without E.C. .. .. April [illegible]

Belgium.—Construction of part of the railway line from Quaregnon to Quévy. The estimated cost of the work is £2,330. General Manager of the company [illegible] Brussels April 4

Last Day.

Caen (France).—The Préfecture at Caen invite offers for laying and working [illegible] system by mechanical means. Offers are to be made to the Préfecture du Calvados, Caen June 1

Canaries.—Construction of a breakwater at the port of Arrecife, Island of Lanzarote, Canaries, at the estimated cost of about £32,000 .. .. April 7

Chile.—It has been decided to postpone the opening of the tenders for the Valparaiso dock scheme until .. .. April 25

Egypt.—Supply and erection of an electric light installation on board H.H.S. *Aida* at Alexandria. The generating plant is to consist of a suitable engine coupled direct to a 5½ kilowatt dynamo, including switchboard, instruments, wiring, lamps, switches, fuses and ventilators. [illegible] Cairo April [illegible]

Egypt.—Tenders will be received at the office of the Assiout Barrage, Assiout, for the construction of a road-bridge over the Ibrahimieh at Mantalout. Contractors should send in their own designs, together with a tender in a lump sum, to the Director of the Barrage. The work is to be completed by June 1st, 1907. Director of the Assiout Barrage. .. .. —

Huelva.—Supply of [illegible] electric cranes to the Port Works Board, Huelva July [illegible]

Johannesburg.—Supply, free, at the municipal stores, of 350 street lamp fittings, 50 stays and 600 ft. gas barrel. Town clerk .. Mar. 31

Lisbon.—Construction of iron bridge (about £1,120). Direccao de Minho e Douro .. May 21

Lisbon.—Construction of a metal bridge over the river Mondego, at Martyr Santo. Ministry of Public Works, Lisbon .. .. .. April 7

Lisbon.—Construction of a metal bridge over the river Velho or Verride. Ministry of Public Works, Lisbon .. .. April 10

Luxembourg.—Supplying electricity to the town of Luxembourg for lighting and tramway traction. "College des bourgmestre et échevins Luxembourg" .. . June 1

Madrid.—The Direccion-General de Obras Publicas invite tenders for an electric railway project in Barcelona .. .. Mar. 31

Madrid.—Concession for an electric railway in Madrid. Directorate-General of Public Works .. .. April 11

Manila.—Construction of two steel breakwaters. Harbour Works Manager . .. .. April 5

Montevideo.—Complete installation of Cerro de Montevideo lighthouse, of nine gaslit buoys, and other work. Ministerio de Fomento .. May 16

Namur.—The "Maison Communale" Couvin (Namur) are inviting tenders for the electric lighting of the town. Secrétariat Communal April 19

Norway.—Supply of steel plates to the Norwegian State Railways. Sealed tenders, marked [illegible] plader," should be addressed to "Maskiningeniorens Kontor, Bispegaden 12, Christiania . . April 5

Prague.—[illegible] local railway from Libochowitz to Jenchowitz. Conditions may be seen at the railway department offices in Prague, Kleinseite, Thomas- [illegible] [illegible]

Rosario.—Public electric lighting. Municipal authorities, Rosario, Argentine .. .. April 16

Rotterdam.—The Netherlands Colonial Office at The Hague require tenders for the supply of the following materials: Contract 414—The metal superstructure with appurtenances for 57 railway bridges; Contract 415—150 axles with wheels for railway carriages and wagons. Mr. M. Nijhoff, The Hague. .. April 4

Sweden [illegible] oil for the use of the Swedish State Railways; 1,500,000 kilos. are to be delivered at Motala, in about five equal quantities, between May 15th and July 15th, and the remaining 400,000 kilos. at Töreboda during July. Sealed tenders, marked "Anbud a Kreosotolja," should be addressed to "Kungl. [illegible]

Sydney (New South Wales).—Supply and erection of (a) boilers, automatic stokers, pipe-work, etc.; (b) turbo-alternator, sub-station machinery, switchboards, etc. Town Clerk .. .. May 7

Talcahuano.—Construction of floating steel dock of 1,000 tons displacement. Direcion del Material, Valparaiso .. .. May 1

Tarragona.—Supply of a motor launch to the Port Works [illegible]

Coming Contracts.

Australasia.—Scheme for a light electric railway from Nhill to Netherby and North Yanac (Victoria), a distance of thirty miles, has been submitted to Nhill Council by Mr. J. C. Lockley, engineer and manager of the local electricity works.

Barnes.—The Local Government Board have sanctioned the borrowing by the Corporation of a loan of £4,700 for electric supply purposes.

Bermondsey.—The Electricity Committee have submitted an estimate to the Borough Council of £2,350 for installing condensing plant to deal with steam from the generating plant.

Birkenhead.—The Corporation have decided to extend their generating plant at a cost of £11,896. The scheme includes the provision of a steam dynamo and condensing plant, and two water-tube boilers.

Bridgwater.—An inquiry was recently held into the Rural District Council's application for a sum of £3,000 required for the purposes of carrying out a scheme of [illegible]

Broughty Ferry [illegible] £2,500 in extending the electricity station within the burgh.

Caistor.—An inquiry has been held into the application of the Urban District Council for sanction to borrow £1,215 for the extension of the existing water supply at Nettleton to the hamlet of Moortown, in the parts of South Kelsey.

Chile [illegible] Antofagasta and Bolivia Railway, and on a survey of a railway between Antofagasta and Mejillones, and between Iquique and the frontier of Bolivia.

China Mongolia.—The Princes of Mongolia are reported to have come to the decision that, after the [illegible] stretched to every important district in Mongolia, to connect it with Pekin.

Coventry.—Electric Lighting Committee have recommended that £35,000 should be expended on extending the generating plant and station buildings.

East Ham.—An inquiry has been held into Corporation's application for sanction to borrow £[illegible]8,750 for electric [illegible]

India.—The Indian Government propose raising a loan of £1,660,000 during the present year for irrigation and railway works.

Kearsley.—The Local Government Board have sanctioned the borrowing by the Urban District Council of £1,4[illegible] for works of sewerage.

Leek.—An inquiry has been held with reference to the application of the Leek Urban District Council for sanction to borrow £4,724 for the purpose of electric lighting [illegible]

Marylebone.—Borough Council has taken up a loan of £48,545 for works in connection with the change over of the voltage supply.

Milan.—Tenders will shortly be invited by the municipality for the construction of two electric tramways.

Norwich.—The expenditure of £2,000 upon the erection of a new boiler-house and the purchase of new boilers is being considered by the guardians.

Pontypridd.—The erection of a new station at Pontypridd has been undertaken by the Taff Vale Railway Company, and it is estimated that the new buildings and extensions will cost about £150,000.

Victoria.—The Canadian Commercial Agent at Melbourne reports that a company in that city purpose establishing a new industry in Victoria, by erecting a plant for the distillation of wood. The cost of the plant and building is estimated at about £12,000.

Walthamstow.—Application is to be made to the Local Government Board for sanction to borrow £10,146, the estimated cost of laying cables to Highams Park.

Wolverhampton.—The Electricity Committee have received sanction to borrow £12,000 for the extension of the electric mains.

Contracts Closed.

Barnes. [illegible] 300-kilowatt steam dynamo and switchgear with Messrs Siemens Bros., at £1,975.

Bloemfontein.—Messrs. J. E. Spagnoletti and Co., [illegible]

Brighton.—The tender of the British Westinghouse Electric and Manufacturing Company, Ltd. has been accepted for work in connection with the air-pump motors at the Southwick Works, at £[illegible].

Brighton.—The British Westinghouse Company's tender, at £135, has been accepted for work in connection with the air-pump motors at the Southwick Electricity Works. The Corporation have also accepted the tender of W. Cory and Son for the annual supply of 15,000 to 20,000 tons of washed nuts coal for use at the Southwick power station, at 13s. 4d. per ton.

Bristol.—The Electrical Committee have placed an order for electric low-tension cables, amounting to £7,887, with Siemens Bros. and Co., Ltd., Westminster, S.W.

Bucharest.—The contract for the electrical equipment of the cotton and bleaching mills erected by Messrs. Coddington and Lamb has been placed with Messrs Veritys, Ltd., Manchester.

Burnley.—The Corporation Electricity Committee have accepted the tender of the British Thomson-Houston Company, to supply motors and starters for the ensuing twelve months.

Burnley.—The tender of the British Thomson-Houston Company, Ltd., to supply motors and motor-starters for the current year has been accepted by the Town Council. Messrs. Siemens Bros. and Co., Ltd., will supply armoured cables.

Bury St. Edmunds.—The Power Plant Company's (Ltd.) tender for portions of generating plant at £[illegible] has been accepted by the Corporation.

Chester-le-Street.—The North-Eastern Railway have commenced operations in connection with the scheme for the extension of their colliery sidings at Stella Gill, near Chester-le-Street, at a cost of £30,000.

Clyde.—The Clyde Bridge Steel Co., Ltd., of Cambuslang, have ordered from Messrs. R. B. Tennant, Ltd., of Coatbridge, the largest mill in Great Britain for rolling steel plates. The body of the rolls is 13½ ft. long.

Croydon.—The Corporation have accepted the tender of the British Westinghouse Electric and Manufacturing Co., Ltd., for 15 double-deck single-truck tramcars, at £7,822.

Campbeltown.—The Campbeltown Shipbuilding Company, Ltd., have contracted with the Bristol Steam Navigation Company to build a steamer of about 3,200 tons dead weight. The new vessel is a duplicate of two steamers recently built by the Campbeltown Company for the same owners.

Gravesend.—The tender of the General Electric Company for the supply of additional plant for the electricity works at £2,044, has been accepted by the Town Council.

Hull.—The Hull Joint Dock Committee and Messrs. S. Pearson, Ltd., of Westminster, have entered into a contract for the construction of the joint dock at Hull.

London.—The British Westinghouse Co. have received an order from the L.C.C. for 334 brake equipments for [illegible] cars, making [illegible] in all of the L.C.C. cars which will be equipped with the Westinghouse magnetic brake when this contract is completed.

Loughborough.—The Brush Electrical Engineering Co., Ltd., have received the following orders; Sunderland Corporation Tramways (per British Westinghouse Co.), six double-deck carbodies with top covers; Metropolitan Electric Tramways Co., ten double-deck bogie carbodies; Lancashire United Tramways, fourteen double-deck carbodies with top covers and four-wheel standard trucks; ten additional trucks; Phœnix Merthyr Coal Co., 80-kilowatt dynamo.

Marylebone.—The Borough Council have accepted Babcock and Wilcox's tender for an ash conveyor and motor equipment, and also that of the Electrical Power Storage Company, Ltd., for the maintenance of two storage batteries for ten years.

Newcastle.—The Glamorgan Coal Company, Ltd., have carried out extensive improvements at their Llwynpia colliery, with a view to the electrification of the surface plant and part of the underground haulage. The necessary electaical plant is being supplied and erected by D. Selby Bigge and Co.

Portsdown.—The Portsdown and Horndean Light Railway Company have placed an order for two double-deck cars with four-wheel trucks with the Brush Electrical Engineering Company, Ltd.

Staffs.—The Potteries Electric Traction Company have placed an order with the Brush Electrical Engineering Company, Ltd., for the supply of five tramcars, at £800 each.

Appointments Vacant.

Croydon.—Chief lectureship in electrical engineering at Croydon Polytechnic for three evenings per week for a session of about thirty weeks. Duties to commence in September. Payment £1 per evening	Mar. 31
India.—The Secretary of State for India in Council will, in the summer of 1906, make not less than ten appointments of assistant engineer in the permanent establishment of the Indian Public Works Department, in addition to the appointments to be made from Cooper's Hill College. The age of candidates must not be less than 21, or more than 24 years on the 1st July, 1906	May 1
London.—An open competitive examination for not fewer than twelve situations as assistant examiner in the Patent Office will be held by the Civil Service Commissioners in April next. Secretary, Civil Service Commission, Burlington Gardens, W.	April 23
South Shields.—Additional instructor for the Marine Engineering Department of the South Shields Marine School. Candidates must hold an extra first-class Board of Trade certificate, and have a sound knowledge of modern steamship auxiliary machinery, dynamos, water-tube boilers, refrigeration, etc., and must be able to lecture. Salary £120. Secretary	Mar. 31

Appointments Filled.

Battersea.—Mr. A. P. MacAlister, chief assistant electrical engineer, is now temporarily in charge of the lighting station at Battersea, pending the appointment, of a successor to Mr. Kemm.

Japan.—Mr. Edward T. F. Crowe, of H.M. Consular Service has been appointed Commercial Attaché for Japan to reside at Yokohama.

Manchester.—Mr. Sidney Russ and Mr. Herbert Stansfield, B.Sc., have been appointed junior demonstrators in physics at Manchester University.

Prices Current of Coal, Iron, Steel, and Other Metals.

Manufacturers' and Merchants' Quotations.

News of the Week in Brief.

Wednesday, March 28, 1906.

THE **Iron Market** is in a very unsettled condition. Some improvement [illegible] in warrants is, however, to be noted. There are heavy withdrawals from the warrant store to meet the large shipments, foreign and coastwise, which are proceeding. In the last few days over 7,000 tons have been taken out of the Cleveland warrant store. The shipments this month will be greater than in any month for a long time. The makers made some fair sales in the middle of the month of Cleveland iron, and with the large quantities which have to be found to meet sea deliveries, have no surplus for the time being. Warrants are 48s. 1½d. No. 3 was 48s. 3d., No. 1 was 49s. 9d., No. 4 foundry 47s. 9d., and No. 4 forge 47s. 3d. Hematite is 69s. to 69s. 4½d. The steel and manufactured iron trades are healthy, with firm prices.

In **Copper** considerable activity has been in progress on the continued great pressure to reduce outstanding commitments on the short side of the market. The supply of warrants for near delivery is concentrated in strong hands. Brokers found great difficulty in covering their shorts, and in the keen competition to square their engagements for April dates, prices rushed up from £80 to £82 5s. per ton, the latter figure being the highest on record since the famous Secretan campaign, which came to grief just seventeen years ago. At that time the public stocks of Copper amounted to 120,000 tons, whilst private stocks were probably as large, if not larger. To-day the private stocks have practically disappeared. The closing prices are again higher at £84 cash and £81 three months.

Tin. Very large operations have taken place in the London market during the past week, leading dealers, some of whom for a long time past were prominent sellers, having turned round and covered heavily for April and May delivery. Prices advanced sharply until they reached the record figure of £168 for near dates, the highest price for many years, whilst three months' Tin fetched as high as £166. This level proved rather tempting to holders, who realised freely, and caused buyers to withdraw their support. A reaction ensued, bringing prices down to £166 15s. cash, and £165 forward, but at the close of the week values are higher at £168 [illegible] respectively, with a [illegible] tendency.

Lead has been a dull market, and speculative interest is waning. Values were fairly well maintained at the beginning of the week and arrivals at small, but in later dealings the price is easier, closing at £16 buyers for soft foreign prompt. **Spelter** is inclined to weakness on realisations, and the closing price is £[illegible] for G.O.B.'s

Iron, Steel, Pig-Iron, etc.

SCOTLAND

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B., [illegible] Prices [illegible] Glasgow [illegible]

Steel:

		£ s. d.
DALZELL STEEL	[illegible] Steel Plates, Marine Boiler Quality	[illegible]
	[illegible]	[illegible]
	Steel Bars, Boiler Quality	[illegible]
DALZELL STEEL	[illegible] Steel Plates, Ship Quality [illegible]	[illegible]
	Bars	[illegible]
	Angles	[illegible]

Manufactured Iron.

	£ s. d.
Bars [illegible]	[illegible]
Best	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Best [illegible]	[illegible]
Best Best	[illegible]
[illegible] Best	[illegible]

[illegible]

Malleable Common Bars: £ s. d.

[illegible]

John Spencer (Coatbridge), Ltd., Phœnix Ironworks, Coatbridge, N.B., quote:—

	£ s. d.
Bar [illegible]	[illegible]
Best	[illegible]
Best Best....	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Best Scrap Rivet	[illegible]
Angles [illegible]	[illegible]
Best	[illegible]
[illegible] Best	[illegible]
Gas Tube Hoops [illegible]	[illegible]
[illegible]	[illegible]
Best [illegible]	[illegible]
Best Best [illegible]	[illegible]
[illegible] Best Best [illegible]	[illegible]
[illegible] Tube Strips [illegible]	[illegible]

[illegible]

Messrs. R. Feldtmann and Co., of Glasgow, quote (commission extra):

Pig-Iron.	No. 1	No. 3
	£ s. d.	£ s. d.
Coltness f.o.b. Glasgow	[illegible]	[illegible]
Gartsherrie	[illegible]	[illegible] 1 [illegible]
Summerlee	[illegible] 7 0	[illegible]
Carnbroe	[illegible]	[illegible] 1 0
Langloan	3 10 0	3 [illegible] 0
Calder	[illegible] 7 0	3 [illegible] 0
Clyde	[illegible] 0	3 1 [illegible]
Glengarnock, f.o.b. Ardrossan	3 [illegible]	[illegible] 1 6
Eglinton	[illegible] 1 [illegible]	[illegible] 18 [illegible]
Dalmellington, " Ayr		[illegible] 0
Shotts " Leith	[illegible] 7 6	[illegible]

NORTH OF ENGLAND.

Messrs. W. Whitwell and Co., Ltd., Thornaby Ironworks, Stockton, quote as follows, at works:

		£ s. d.
W. W. ♔ Bars		7 10 0
W. W. Best Bars		7 17 6
W. W. Best Best		8 5 0
W. W. Best Best Best		8 12 6
W. W. Best Shoe		8 0 0
Thornaby ♔		9 0 0
Thornaby Best		9 10 0
Thornaby Best Best		10 10 0
Whitwell Special Admiralty Cable		11 0 0
Special Chain Iron		10 0 0
Tube and Nail Strip Iron	net cash	7 10 0
W. W. ♔ Angle Iron		7 12 6
W.W. Best Angle Iron		8 0 0
Tee Iron, to 8 inches United		8 10 0

Terms, Cash, less 2½ per cent. discount on 10th of month following delivery.

LANCASHIRE.

The Pearson and Knowles Coal and Iron Company, Ltd., Dallam and Bewsey Forges, Warrington, quote as follows:—

		Iron	Steel
		£ s. d.	£ s. d.
♔ (BNF)	Bars	7 1[illegible] 0	8 0 0
	Angles	8 [illegible] 0	8 10 0
	Tees	8 15 0	9 0 0
	Plates	8 1[illegible] 0	9 0 0
♔ W·I·W	Hoops	8 0 0	8 0 0
	Sheets	8 1[illegible] 0	9 0 0
	Steel Wire Rods, hard and soft		

Ordinary Sizes, F.A.S. Liverpool in 10-ton Lots.
Extras for Sizes and Cutting as per List.
Lots under 10 cwt. of a size 10s. per ton extra.

STAFFORDSHIRE.

Shelton Iron, Steel, and Coal Company, Ltd., Stoke-on-Trent, North Staffordshire, and 122, Cannon Street London, quote:

	£ s. d.	
Crown Bars	[illegible] 10 0	per ton.
Best Bars (1 to 6in. wide, above ¾in. thick, ¾ to 3in. rounds and squares)	8 0 0	"
Angles	7 15 0	"
" Best	8 [illegible] 0	"
T [illegible] "	8 0 0	"
" Best	8 10 0	"
Best Shoe Iron	8 0 0	"
" Rivet Iron	9 0 0	"
" Best Rivet (Special)	10 [illegible] 0	"
" Cable	10 5 0	"
" Screwing	9 5 0	"
Best Turning	8 0 0	"
" Plating	9 [illegible] 0	"
Best Best	10 15 0	"
Treble Best	11 15 0	"
Plates	8 16 0	"
Best Plates	9 0 0	"
" Boiler Plates	9 10 0	"
" Best Boiler Plates	10 10 0	"
Treble Best Boiler Plates	13 0 0	"

Delivery f.o.b. Liverpool, Birkenhead or Manchester.

Tinplates.

WALES.

Swansea Metal Exchange [illegible]:

	£ s. d.
Tinplates, IC [illegible] by 14, 112 sheets, [illegible], Bessemer primes	[illegible] 12 [illegible]
Wasters	0 1[illegible] 10
Siemens primes	0 1[illegible] 10½
Wasters	0 12 0
IC [illegible] sheets, [illegible] Bessemer primes	0 12 10½
Wasters	[illegible]
Siemens primes	0 1[illegible] 0
Wasters	0 1[illegible]
IC 28 by 20, 112 sheets, 216lb., Bessemer primes	0 25 6
Wasters	0 [illegible]
Siemens primes	0 [illegible]
Wasters	0 [illegible]
IC [illegible] sheets, [illegible] lb., Siemens primes	0 18 0
Wasters	0 1[illegible]
IC [illegible] by [illegible] sheets, [illegible] lb., Bessemer primes	0 1[illegible]
Wasters	0 1[illegible] 0
IC 19¾ by 14, 120 sheets, 110lb., Bessemer primes	0 12 9
Wasters	0 12 [illegible]
[illegible] Bessemer primes	0 1[illegible] 10½
Siemens primes	0 1[illegible] 0
[illegible] sheets	[illegible] 10 0 per ton
[illegible]	[illegible]
Finished black plates	[illegible] 1[illegible] 6

All f.o.b. Swansea, cash in [illegible] days less [illegible] per cent.

Block [illegible] cash, [illegible] three months.

Swansea Harbour Trust official return of tinplates—
Received from works, [illegible],194 boxes.
Shipped during week, 2[illegible],[illegible] boxes.
Stock remaining at docks, [illegible] boxes.

Messrs. Richard Thomas and Co., Ltd., of 33 and 35, Eastcheap, E.C.—Works: South Wales, Burry, Lydney Lydbrook, and Cwmbwrla, quote:

Coke Tinplates:		Per Box f.o.b. Wales. £ s. d.
C 18¾ by 14 112s. 100lb.	"BV"	0 12 [illegible]
C [illegible] by 10 [illegible]	"Jumbo"	0 19 9
C 20 by 14 112s. 108 ,,	"Lydbrook"	0 12 6
C [illegible] by [illegible] 112s. [illegible]	"Lydbrook"	1 5 [illegible]
Charcoal Tinplates:		
C [illegible] by 14 112s. 108 ,,	"Alloway"	0 13 [illegible]

WORCESTERSHIRE.

Baldwins, Ltd. (with which is amalgamated Knight and Crowther, Ltd.), Wilden Works, near Stourport, quote:

	Singles [illegible] by 36in. per ton	Doubles [illegible] per ton
Black Sheets:	£ s. d.	£ s. d.
"A.B."	11 0 0	12 0 0
"Shield"	11 10 0	12 10 0
"Severn"	12 10 0	13 10 0
"Baldwin Wilden B."	13 10 0	14 10 0
Charcoal	17 10 0	18 10 0
Best Charcoal	19 10 0	20 10 0

Pickled, cold rolled and close annealed sheets specially quoted for.

Extra widths: Singles to [illegible]in., Doubles to [illegible]in., Lattens to 46in. Extra lengths: Singles to [illegible]in., Doubles to 1[illegible]in., Lattens to 108in.

Patent Coated Sheets:	£ s. d.	£ s. d.
No. 3 Lead	14 10 0	15 10 0
S.V. Lead	16 0 0	17 0 0
No. 3 Terne	16 0 0	17 0 0
S.V. Terne	17 10 0	18 10 0

	Singles 20 G to 108 by 36in. per ton.	Doubles 21 to 24 G to 96 by 36in. per ton.
Tinned Sheets:	£ s. d.	£ s. d.
Best Coke Finish	30 0 0	31 10 0
" Charcoal Finish	32 0 0	33 10 0
Extra	34 0 0	35 0 0

Cotton Cop Tin Sheets to [illegible]in. by 36in. specially quoted for.
Tinplates [illegible] K [illegible] Best Charcoal, £1 7s. 0d. per box.
Extreme sizes in Tin and Patent Coat specially quoted for.
Lattens up to [illegible] by [illegible] 7 W.G. £1 10s. 0d. per ton extra throughout for all brands.
At work.

Galvanized Corrugated Sheets	
"Phoenix" Brand, 24 G., f.o.b. London, in Bundles	[illegible] per ton
"Blackwall" Brand, 24 G., [illegible]	
Australia, f.o.b. London	[illegible]
Galvanised Working Up-Sheets	£ s. d.
24 G., f.o.b. London in Bundles	[illegible] per ton

WALES.

Cordes (Dos Works), Ltd., of Newport, Mon., [illegible] "Steel [illegible] patent wrought nails [illegible]

Discounts -

[illegible] per cent. off 1 inch to [illegible] inch [illegible] and sixty pounds

[illegible] per cent. off [illegible] inch to 7 inch [illegible]

[illegible] per cent. off all [illegible] points [illegible]

Delivered in lots of 4 cwt. and upwards [illegible] per cent. discount off the [illegible] two tons and upwards.

Steel [illegible] points [illegible] inch to 7 inch [illegible]

[illegible] per cwt. [illegible] Railway Station

4 cwt. lots and upwards 10/9 per cwt.

Steel [illegible] nails [illegible] inch to [illegible] inch [illegible]

[illegible] per cwt. [illegible] Railway Station

4 cwt. lots [illegible] per cwt.

Slit rods (iron) £8 per ton, at works for 2-ton lots.

BELGIUM.

C. L. Faulkner, Suffolk House, Laurence Pountney Hill, London, E.C., quotes:

Prices quoted are in £ stg. and per ton [illegible] delivered free on board ANTWERP for approved [illegible]

		£	s.	d.	
Steel:					
Blooms	at	4	14	0	per ton.
Billets	at	4	16	0	
Sheet Bars	at	4	18	0	
Finished Steel.					
Bars	at	[illegible]	[illegible]	0	
Angles	at	[illegible]	10	0	
Tees	at	[illegible]	10	0	
Joists	at	[illegible]	[illegible]	0	
Fencing Standards	at	[illegible]	[illegible]	[illegible]	
Shoeing Bars	at	[illegible]	2	6	
Tyre Bars	at	6	2	6	,,
Half-round Bars	at	6	8	0	
Heavy Rails	at	[illegible]	[illegible]	0	
Light Rails	at	[illegible]	1	0	

Structural Steelwork. Prices on application.

GERMANY AND BELGIUM.

Messrs. Oscar Moenich and Co., Billiter House, Billiter Street, E.C., quote

	£	s.	d.	
Belgian No. 2 Bar Iron	[illegible]	1[illegible]	6	per ton
Nail Rods	[illegible]	17	6	,,
Rolled Rod Iron	[illegible]	[illegible]	[illegible]	,,
Angle Iron	[illegible]	[illegible]	0	,,
Tee Iron	[illegible]	0	0	,,
Iron Plates	[illegible]	[illegible]	0	,,
Basic Steel Bars	[illegible]	[illegible]	[illegible]	,,
,, ,, Rods	[illegible]	1[illegible]	[illegible]	,,
,, ,, Plates ¼ in. and thicker	[illegible]	1[illegible]	0	,,
Joists from	[illegible]	0	0	
All net f.o.b. Antwerp.				
"Double Horse" Bamboo Steel	1[illegible]	[illegible]	[illegible]	,,
"Double Lion" Steel, ½ in. to 1 in.	[illegible]	1[illegible]	[illegible]	,,
In cases f.o.b. Antwerp.				
Wire Nails No. 6/7	0	8	6	per keg.

CONTINENTAL.

Messrs. W. H. Perrott and Co., 101, Leadenhall Street, London, E.C., quote f.o.b. Antwerp, for approved specifications –

	£	s.	d.	
Steel Joists, Basis	[illegible]	[illegible]	0	per ton [illegible]
,, Channels, ,,	[illegible]	11	[illegible]	,,
,, Bars ,,	[illegible]	1[illegible]	[illegible]	
,, Angles, ,,	[illegible]	17	[illegible]	,,
,, Tees, ,,	[illegible]	[illegible]		
,, Sheets ,,	[illegible]	[illegible]	[illegible]	
,, Plates ¼ in. and up,	[illegible]	1[illegible]		,,
,, Rods ⅜ in. to ¾ in. about equally assorted	[illegible]	[illegible]	[illegible]	
,, Light Rails..	[illegible]	[illegible]	[illegible]	
,, Rivets (Siemens Martin), basis	8	13	6	,,

To Lloyd's Tests, packed in Double Bags.

Messrs. Edward Le Bas and Co., Dock House, Billiter Street, London, E.C., quote per ton, f.o.b. Antwerp, London [illegible]

Bars, No. 3, Iron	[illegible]
Bars, Steel	[illegible]
Rods, Iron	[illegible]
Rods, Steel	[illegible]
Angles, Iron	[illegible]
Angles, Steel	[illegible]
Tees, Iron	[illegible]
Tees, Steel	[illegible]
Joists, Steel	[illegible]
Channels, Steel	[illegible]
Rails, Heavy	[illegible]
Rails, Light	[illegible]
Standards for Fencing, Bolts, &c.	[illegible]
Sheets, Steel [illegible]	[illegible]
Sheets, Steel, [illegible]	[illegible]
Plates, Iron [illegible] and up	[illegible]
Plates, Steel Ship quality	[illegible]
Plates, Steel Boiler quality	[illegible]
Plates, Chequered	[illegible]
Hoops, Black	[illegible]
Hoops, Galvanised	[illegible]
Wire Fencing [illegible]	[illegible]
Zinc Sheets	[illegible]
Sheets, Galvanised, Corrugated, [illegible]	[illegible]
Copper Sheets, 4 by 2	[illegible]
Y. M. Sheets	[illegible]
Lead Sheets	[illegible]
Copper Wire	[illegible]
Brass Wire	[illegible]
Tin Plates [illegible] Coke [illegible]	[illegible]
Wire Fencing Black	[illegible]
Wire Fencing Galvanised	[illegible]
Hard Spelter	[illegible]

Metals.

Messrs. French and Smith, 147, Leadenhall Street, and 11, Oldhall Street, Liverpool, quote: -

TIN

	£ s. d.	£ s. d.
Tin		
English Ingots, f.o.b., Dis. 1¾ %	[illegible]	[illegible]
English Bars, f.o.b., Dis. 1¾ %	[illegible]	[illegible]
Straits G. M. B., cash, Warehouse Net	[illegible]	[illegible]
Straits G. M. B., 3 months Warehouse, Net	[illegible]	[illegible]
Australian Mt. Bischoff, Warehouse Net	[illegible]	[illegible]

COPPER

	£ s. d.	£ s. d.
Copper		
Standard G. M. B., cash, Warehouse Net	[illegible]	[illegible]
Standard G. M. B., 3 months, Warehouse Net	[illegible]	[illegible]
English Tough Cake & Ingot, Warehouse Net	[illegible]	[illegible]
English Best Select, Warehouse Net	[illegible]	[illegible]
English Sheet and Sheathing, f.o.b. Dis. [illegible]	[illegible]	[illegible]
English Strong for India, f.o.b. Dis. [illegible]	[illegible]	[illegible]
Electro, Warehouse, Net	[illegible]	[illegible]
Ore, ex ship	[illegible]	[illegible]
Regulus, Matte and Precipitate, ex ship	[illegible]	[illegible]

YELLOW METAL

	£ s. d.
Yellow Metal:	
Sheets, [illegible] for India f.o.b., Dis. [illegible]	0 0 7¼ per lb.
Sheathing	[illegible]

SPELTER

Silesian [illegible] Net	[illegible]
Blende [illegible] Net	[illegible]
Calamine Net	[illegible]

LEAD.

English Pig, Warehouse Dis. [illegible]	[illegible]
Spanish, ex ship, Dis. 2½%	15 17 6 to 16 0 0 ,,
Lead Ore [illegible], Net	[illegible] 16 [illegible]

ANTIMONY

	£ s. d.	
Star Regulus, [illegible]	[illegible]	per ton
Ore, [illegible]	[illegible]	
Crude, [illegible]	4 [illegible]	

QUICKSILVER

	£ s. d.	
Spanish, [illegible] Warehouse, [illegible]	[illegible]	per flask
Italian [illegible]	[illegible]	

Coal.

LEICESTERSHIRE.

The Nailstone Colliery Company, Leicester, quote Price per ton at Pit [illegible]

Upper Main Seam:	s.	d.
Main Coal	6	6
Best Hard Steam (hand picked [illegible] Railway Companies)	[illegible]	6
Best Hard Steam Cobbles [illegible] (free from slack)	5	6
Fine Slack	[illegible]	0

Terms, net cash [illegible]

DERBYSHIRE.

The Manners Colliery Company, Ltd. of Ilkeston, quote as follows, per ton at pit:

Kilburn Coal:	s.	d.
Best London Brights	9	6
Large Nuts [illegible]	9	0
Small Nuts [illegible]	6	0
Peas [illegible]	5	0
Rough Slack	4	3
Slack	3	0
Smudge	2	0
Rutland Coal:		
Brights [illegible]	7	6
Large Nuts [illegible]	7	0
Slack	[illegible]	6
Hand-picked Hard	7	6
Hard Cobbles	[illegible]	[illegible]

The Clay Cross Company's Collieries, Clay Cross, near Chesterfield, quote:

	per ton at pit s.	d.
Best Main Coal	10	6
Best Silkstone	10	0
Best Hard Coal	8	6
Best House Nuts	8	0
Treble Screened Cobbles	7	0
Best Cobbles	[illegible]	[illegible]

NOTTINGHAMSHIRE.

The Digby Colliery Company, Ltd., near Nottingham, quote per ton at pit:

Digby Coal:	s.	d.
STEAM		
Best Hand-picked Hard	8	[illegible]
Steam Hard	[illegible]	[illegible]
Hard Nuts	[illegible]	[illegible]
Gedling Colliery:		
[illegible] House Coal		
London Brights [illegible]	11	[illegible]
Best Cobbles Hand Picked	10	6
Large Nuts [illegible]	10	0
Small Nuts [illegible]	8	[illegible]
Pea Nuts [illegible]	[illegible]	0
STEAM (Top Hard)		
Best Hard	8	6
Hard Steam	7	6
Cobbles	[illegible]	[illegible]

The Swansea Exchange quotations are:

Anthracite:	s. d.		s. d.
Standard hand picked malting [illegible]	18 0	to	19 0
Second quality, malting	17 0	to	18 0
Swansea Valley Big Vein	11 [illegible]	to	11 6
Red Vein	10 [illegible]	to	10 9
Machine made cobbles	17 0	to	18 6
Machine made nuts	18 0	to	19 6
Machine made peas	[illegible] 6	to	11 6
Steam:			
Best large	14 9	to	[illegible]
Second quality	[illegible]	to	13 6
Ordinary large bunker coal	12 6	to	13 0
Through bunkers	11 0	to	11 6
Small according to quality	8 0	to	8 6
Bituminous:			
No. [illegible] Rhondda large	14 3	to	14 6
Small	9 9	to	10 [illegible]

All f.o.b. less 2½ per cent. discount for cash, at 30 days, exclusive of tax.
Patent fuel, 12s. to 12s. 3d. net f.o.b., inclusive of tax.

The Cardiff Exchange quotations [illegible]

	s. d.		s. d.
Best Cardiff [illegible] steam	14 [illegible]	to	[illegible]
Second Cardiff [illegible] steam	14 6	to	[illegible]
Ordinary [illegible] steam	[illegible]	to	14 [illegible]
[illegible]	[illegible]	to	13 [illegible]
Best [illegible] Black Veins	14 [illegible]	to	14 6
Best small [illegible]	[illegible]	to	10 [illegible]
Second small steam [illegible]	[illegible]	to	[illegible]

[illegible] f.o.b. Cardiff except Monmouthshires, which are f.o.b. Newport [illegible] Cardiff [illegible] days, less 2½ per cent., exclusive of tax.

	s. d.		s. d.
Patent fuel	[illegible]	to	[illegible]

Coke:

	s. d.		s. d.
Foundry [illegible]	[illegible] 0	to	[illegible] 6
Special foundry	23 0	to	24 [illegible]
Furnace	[illegible]	to	16 [illegible]

North-East Coast quotations [illegible]

	s. d.		s. d.
Best steams, Tyne and Blyth, prompt	10 [illegible]	to	[illegible]
Ditto forward			11 [illegible]
Seconds	[illegible]	to	10 0
Smalls	7 [illegible]	to	8 0
Best [illegible]	10 [illegible]	to	10 6
Ditto, [illegible]	[illegible]	to	10 0
Durham [illegible]	[illegible]	to	10 6
Coking	[illegible]	to	[illegible] 6
Smithy	[illegible]	to	10 [illegible]
Best [illegible]	11 [illegible]	to	12 [illegible]
[illegible]	[illegible] 0	to	[illegible] 6
[illegible]	11 [illegible]	to	[illegible] 6
Ditto [illegible]			[illegible] 6
Ditto, [illegible] Harbour	12 [illegible]	to	[illegible] 0
Ditto, Hartlepool	12 [illegible]	to	[illegible] 6
Best Coal [illegible]			18 6
Foundry	17 0	to	17 6
Furnace	16 [illegible]	to	16 6

Lancashire Coal quotations [illegible]

	s. d.		s. d.
Best [illegible]	7 [illegible]	to	8 [illegible]
[illegible]	8 [illegible]	,,	[illegible] 6
Best [illegible]	[illegible]	,,	7 [illegible]
[illegible]	[illegible] 0	,,	[illegible]
[illegible]	[illegible]	,,	[illegible]
[illegible]	10 [illegible]	,,	[illegible]
[illegible]	[illegible]	,,	[illegible]

Delivered Manchester Ship Canal [illegible]

Chemicals.

Messrs. S. W. Royse and Co., Albert Square, Manchester [illegible]

		£ s. d.	
Acids: Oxalic		0 0 2⅜	per lb.
Picric, Crystals		0 0 11	,,
[illegible]	[illegible] Manchester	0 0 11	,,
Acetate of Lime: Brown	[illegible] Manchester [illegible]	8 [illegible] 0	per ton.
Grey		11 15 0	,,
Alumina [illegible] Lump [illegible]		[illegible] 7 [illegible]	
in casks		[illegible] 10 0	
Ground, in bags		[illegible] 17 [illegible]	
[illegible] Alumina [illegible]		4 10 0	
		£ s. d.	
Ammonia: Carbonate		0 0 3⅜	per lb
[illegible] Grey	f.o.b. Liverpool	[illegible]	per ton.
Salammoniac, Lump	1sts, delivered U.K.	42 0 0	
	2nds	40 0 [illegible]	
Sulphate	f.o.b. Liverpool	12 7 6	
Arsenic [illegible] Powder	[illegible]	26 0 0	per ton
Bleaching Powder, 35%		4 10 0	,,
Borax [illegible] Crystal		[illegible] 0 0	,,
Coal Tar Products:		£ s. d.	
[illegible]		0 0 8[illegible]	per gal
,, [illegible]		[illegible]	
Carbolic Acid Crystals, 34/35° C.		0 0 6	per lb.
[illegible] C.		[illegible] 0 6¼	,,
Liquid, 97 [illegible]		0 0 10	per gal.
Crude, 60 [illegible]	f.o.b.	0 1 9¼	,,
[illegible] good liquid		0 0 1¾	
[illegible]		0 0 4	
[illegible] at 160° C.	f.o.b.	0 1 1½	
95% at 160° C.	,,	0 1 [illegible]	
90% at 160° C.		0 1 [illegible]	
[illegible] flash point over [illegible]	f.o.b.	0 1 2	,,
Rectified, flash point over 100° F.	f.o.b.	0 1 3	,,
Napthalene, all qualities.			
Pitch	f.a.s. Manchester	1 [illegible]	per ton.

Copperas [illegible] Liverpool [illegible]

Copper Sulphate [illegible]

Cyanides [illegible]

Lead [illegible] Manchester [illegible]

Litharge, Flake..

Red Lead [illegible] London [illegible]

White „ „ Dry ...... „

[illegible] Wood [illegible]

Potash [illegible] England [illegible]

Carbonate [illegible] Hull 16 15 [illegible]

Prussiate Yellow [illegible]

Soda [illegible]

[illegible] 70% [illegible]

[illegible]stals, in bags ...

[illegible] i.f. Hull net 16 15

[illegible], in 1 cwt. kegs .

[illegible] England [illegible]

[illegible] ex quay Liverpool, „

Sulphur [illegible]

Minerals.

Messrs. S. W. Royse and Co. quote:—

£ s. d.

Barytes [illegible]

China Clay [illegible] for all purposes [illegible] ton, f.o.b. Cornwall; stocks also kept [illegible]

Chrome Ore: Basis 50% .... c.i.f. British Ports 3 10 0 „

Manganese [illegible]

[illegible]

Messrs. Henry Bath and Son quote:—

Copper [illegible]

Tin Ores [illegible]

Lead Ore [illegible]

Blende [illegible]

Calamine [illegible]

Antimony [illegible]

Messrs. Barrington and Holt, Cartagena, quote:—

Iron Ore [illegible]

„ .... „ Cartagena 5 7 „

Special Iron Ore .... „ „ nominal „

Specular 58% do. .... „ „ 11 7 „

Manganese [illegible]

Lead Ore:

[illegible]

Zinc Ore:

[illegible]

Messrs. Thomas Morrison and Company, Bilbao,

[illegible]

[illegible] deadlock.

Timber.

Messrs Alfred Dobell and Co., Liverpool, quote [illegible]

COLONIAL WOODS.

[illegible]

Deals [illegible]

Spruce Boards [illegible]

UNITED STATES, ETC., WOODS

Pitch Pine.

Oak Timber

Oak Planks

East India Teak

Greenheart

EUROPEAN WOODS.

Timber

[illegible]

Norway Deals

Deals.

[illegible]

Weekly Synopsis of Company Meetings and News.

P. and W. Maclellan.

The ordinary general meeting [illegible] on Saturday last, Mr. William [illegible] M[illegible] [illegible] moved the adoption of the report and balance-sheet. He was glad to say that the result of last year's trading had been very satisfactory, and that they had been able to add substantially to their reserve fund. The work in progress at the end of the year was larger than in recent years and the works would be busily employed for three or four months to come, except in the matter of bridge-building, which was very slack. There were prospects of work being in the market, but on the other hand, rumours were heard of labour troubles which might militate against the chances of obtaining these orders. The report was adopted. It was resolved to pay dividends of 6 per cent. on the preference shares and 6 per cent. on the ordinary shares, and also a surplus dividend of [illegible] per cent. on both the preference and the ordinary shares.

Marconi's Wireless Telegraph Company.

Colonel Sir Charles Euan Smith presiding on Monday at the annual meeting of the shareholders in Marconi's Wireless Telegraph Company, held in River Plate House, E.C., said that they were making progress, despite the fact that the organisation of the company was not yet complete, but under the circumstances the progress was necessarily slow. They were not now deriving any benefit from a branch of their business from which they might expect to derive considerable profit in the future, namely, the transmission of long-distance messages. The profit for the year was equivalent to a dividend of 7 per cent. on the issued capital, but the expenses of the company were so great that the directors thought it would be wiser to carry forward that, along with the balance brought forward from last year, [illegible] equivalent to another [illegible] per cent. The report and accounts were adopted.

Bede Metal and Chemical Company.

The annual meeting was held at Newcastle on Monday. The annual report showed that the profit for the year had been £21,886 18s. 1d., and, with last year's balance added, the available balance was £[illegible] 5s. 2d. The report was adopted, and a dividend at the rate of 5 per cent. per annum (less interim dividend of [illegible] per cent.) declared. Sir Andrew Noble and Mr. Alfred M. P[illegible], the retiring directors, were re-elected.

Brush Electrical Engineering.

There was a gross profit of £[illegible] for the year 1905 and a net balance of £34,719, from which the dividend published on the 20th inst. will be paid. The depreciation reserve fund stands at £52,000, and the general reserve fund at £24,000. The report states that the works output for the year has been the largest in the history of the company, and the general turnover of the contracting and other departments of the company's business has also been satisfactory. There has been [illegible] for the company's steam turbines and reciprocating engines directly coupled to electric generators for lighting, power, and traction purposes. In the field of rolling stock for main line railways, valuable contracts have been secured.

W. T. Glover and Co.

The report states that the amount standing to the credit of profit and loss is £[illegible]. B[illegible] generally has shown some improvement during the year. The directors have consequently been able to strengthen the financial position of the company by setting aside £17,290 10s. 1d. for the creation of an Investment Contingency Fund, which, with £8,000 they have transferred from the reserve fund, and £793 14s. 11d., the profit derived from the realisation of investments, amounts to £26,084 5s. The directors' first consideration having been to strengthen the company's financial position, they do not recommend the payment of a dividend.

Stewarts and Lloyds.

The report for the year ending December 31st, 1905, states that the net profit for the year, after setting aside £40,000 for depreciation, amounts to £146,946, and adding the amount brought forward, the available balance is £200,045. Deducting the interim dividends for the half-year to June 30th, 1905 (paid on September 29th, 1905), at the rate of 6 per cent. per annum on the preference and 9 per cent. per annum on the ordinary shares, amounting to £54,750, there remains a balance of £145,295, which the directors recommend should be appropriated as follows: To reserve fund, £25,000; to payment of dividend for half-year on the preference shares, £16,500; to payment of dividend for half-year ended December 31st, 1905, at the rate of 11 per cent. per annum on the ordinary shares (free of income-tax), £46,750—leaving a balance to be carried forward of £57,045. The dividend on the ordinary shares of 11 per cent. now recommended, together with the interim dividend at the rate of 9 per cent. per annum paid in September last, is equivalent to a total dividend on the ordinary shares of 10 per cent. for the year 1905.

British Insulated Helsby Cables Company.

The tenth annual meeting of the above company took place in Liverpool on Friday last. Mr. E. K. Muspratt presided. The chairman said the profit for the past year was £133,902, compared with £129,817 in the previous year. £22,000 had been written off property and plant, £8,500 had been placed to special reserve account, and the usual amount of £5,000 to the debenture redemption account. A further dividend on the ordinary shares was recommended of 4 per cent., making 8 per cent. for the year, which would leave £10,439 to be carried forward. Investments now stand at £463,348, against £470,383 last year. This money was invested principally in the Midland Electric Corporation for Power Distribution and Electric Supply Company of Victoria. The report was adopted.

Robey and Co., Lincoln.

The trading profit [illegible] depreciation [illegible] after payment [illegible] interest there is a disposable balance, including £568 brought forward, of [illegible]. It is proposed [illegible] per share on the ordinary shares [illegible] off investment [illegible] and to [illegible] forward.

British Electric Transformer Company.

The report for the year ended December 31st, 1905, states that, after paying all manufacturing costs and the expenses of administration, there remains a net profit of £10,228, which, with the amount brought forward makes a total available balance of £12,690. The board recommend that this balance shall be allocated as follows: To depreciation reserve, £1,500; to reserve fund, £2,000; to preliminary expenses written off, £1,500; to payment of preference dividend, £1,730, and to a dividend of [illegible] per cent. [illegible] carrying [illegible]

North-Eastern Steel Company.

The report for the year ended December 31st states that the profit for the year amounts to £72,439, to which has to be added the sum brought forward. After providing interest on debenture stock, second mortgage debentures and loans, and directors' fees, the entire cost of remodelling two blast furnaces, £15,577 is charged to revenue; a sum is written off rolling stock, equal to 0·62 per cent. (£2,725); the Thiel royalty takes [illegible] written off special expenses [illegible] the second debenture issues, £6,918; depreciation on machinery and plant and buildings, £20,000; carried forward, £3,615. The directors add that the indications of improved trade referred to in the last report have been realised.

Sir W. G. Armstrong, Whitworth and Co.

The directors have declared an interim dividend of 10 per cent. per annum on the ordinary shares, free of income-tax, and 4 per cent. per annum on Nos. 1 to 76,970 preference shares, less income-tax.

Evered and Co.

In their report for the year ended December 31st, the directors recommend, after transferring £3,500 from the fund for the equalisation of dividends, a dividend of 5 per cent., and that £1,500 be written off plant and building, leaving £3,538 to be carried forward.

New Companies Registered.

In the following list the registered addresses of New Companies are given whenever possible. As, however, this information may be legally withheld until the actual date of commencing business, addresses are not always obtainable.

Jackson and Pochin.

[illegible] Jackson [illegible] business of [illegible] engineers carried on by W. Jackson and H. N. Pochin, at 43, Humbertstone Road and James Street, Humberstone Gate, Leicester, as Jackson and Pochin. No initial public issue. First directors (not less than three nor more than five): W. Jackson and H. N. Pochin (managing directors), H. W. Statham and J. Pochin (all permanent, subject to holding £500 shares). Remuneration [illegible]

Bryan, Donkin, and Co.

[illegible]

Donkin and Clench Ltd., to adopt an agreement with [illegible] L. Melville, and G. H. Shipley, and to carry on the business of agricultural and general engineers, ironfounders, [illegible] Melville, E. A. Smith, and G. H. Shipley (chairman). Qualification (except managing director), £500. Ordinary directors £600 per annum, divisible; managing director as fixed by the board.

George Bell and Sons.

[illegible] George Bell [illegible] for public works, ironfounders, engineers, builders, builders' merchants, hardwaremen, manufacturers of rolling stock, etc. No initial public issue. G. Bell is permanent governing director, subject to holding £1,000 shares or stock, and may appoint other directors. Remuneration [illegible]

Lawden Foundry Company.

[illegible] known as the Lawden Foundry, carried on at 37, Lawden Road, Bordesley, Birmingham, by Motor Plants, Ltd. No initial public issue. First directors (not less than two nor more than five) are not named. Remuneration as fixed by the company. 120, Alcester-road, Moseley, Birmingham.

Churchill Machine Tool Company.

[illegible] of £1). To acquire the business carried on by Charles Churchill and Co., Ltd., at their engineering works in Frederick-road, Pendleton, Manchester. Minimum cash subscription, 10 per cent. of the shares offered to the public. First directors (not less than three nor more than seven): W. Chamberlain, C. Churchill, C. H. Churchill, and J. W. Gabriel. £500.

Willingsworth Iron Company.

This company has just [illegible] of £25,000 in £1 shares, to take over the business of ironmasters carried on by J. H. Yates and P. H. Yates, at the Willingsworth Ironworks, Wednesbury, as the Willingsworth Iron Company, to adopt an agreement with the said vendors, and to carry on the said business and that of steel makers and converters, colliery proprietors, founders, etc. The subscribers are: J. H. Yates, P. H. Yates, O. H. Stone, R. E. Yates, J. A. Fyshe, F. W. Yates and R. C. Chavasse.

Company Liens.

Phoenix Dynamo Manufacturing Company.

[illegible] mental to a trust deed dated July 20th, 1903, for securing £5,000 debentures, and lien registered February 27th [illegible] secured on certain freeholds lands, buildings, and premises [illegible] property, present and future, including the uncalled [illegible]

Share List of Engineering, Electrical, Iron and Steel, and other Companies.

The following is a comprehensive list of Companies in the industries covered by "Page's Weekly," in which shares business is being currently transacted. Additions will be made from time to time as occasion requires. We desire it to be understood that while our Share List will generally be found correct, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies.

Stock Exchange Settling Days.—Settling days on the Stock Exchange are as follows:—
Consols, April 4th. General Settlement, April 11th and 25th; May 11th. Bank Rate, September [illegible], 1905, 4 per cent.

Engineering, Iron, and Steel Companies.

Present Amount subscribed	Shares	Last Dividend	[illegible]	Paid up	Closing Prices
[illegible]	5	[illegible]	Alldays & Onions Pneumatic Engineering, Ltd.	3	[illegible]
20,000	5	[illegible]	Do. Cum. Pref. [illegible] per cent.	5	[illegible]
80,000	Stk	4½%	Do. Mort. Deb. 4½%	100	[illegible] 103
65,000	1	5¼	[illegible] and [illegible], Ltd. [illegible] Cum. Pref. Nos. 1 [illegible]	1	[illegible]
[illegible]	1	[illegible]	Armstrong (Sir W. G.), Whitworth and Co., Ltd.	1	[illegible]
76,970	5	2/	Do. 4[illegible] Cum. Pref.	5	5[illegible] 5[illegible]
1,500,000	100	4	Do. 4 1st Mort. Dbs. Rd	100	10[illegible] 104
15,000	10	4½	Arrol, Sir William & Co., Ltd. 4½ Cum. Pref. Nos. 1 [illegible] 000	10	10 10½
7,000	10	[illegible]	Austin [illegible] & Son Ltd. [illegible] Pref.	all	[illegible]
[illegible]	100		Do. 4% 1st Mort. Deb.	100	[illegible]
[illegible]00,000	100	4½	Aveling and Porter, Ltd., 4½ Reg. Mt. Debs. Red.	100	94–97
[illegible]	5	10%	Avery (W. & T.), Ld.	5	10–10½
[illegible]	5	5%	Do. Cum. Pref. 5%	[illegible]	[illegible]
109,000	Stk	4	Do. Deb.	100	100 105
[illegible]	1	1/7	Babcock and Wilcox, Ltd., Ord.	1	4–4½
100,000	1	7½d.	Do. ,, 6% Cum. Pref.	1	[illegible]
20,000	1	5%	Bagnall (John) & Son Ltd.	1	12/0 16/0
20,000	5	3	Baker (Joseph) and Sons, Ltd., 6% Cum. Pref.	5	[illegible] — 5¼
250,000	1	6½d.	Baldwins, Ltd., 5½% Cum. Pref.	1	[illegible]
250,000	Stk	4½%	Do. 1st Mt. 4½ Deb. Stk. Red.	100	104 10[illegible]
150,000	4½	1	Barrow Hæmatite Steel Co., Ld., O.	4½	[illegible]
50,000	4½	[illegible]	Do. do. Cum 2nd. Pref.	4½	[illegible]
[illegible]	5	5	Bayliss, Jones and Bayliss, Ltd., 5 Cum. Pref. Shares	5	[illegible]
510,000	100	4½	Beardmore (Wm.) & Co., Ltd. 4½ 1st Mt. Debs., Red., Scrip 50% pd		105 107
50,000	10	6/	Bell Brothers, Ltd., 6% Cum. Pref.	10	12¼ 12¾
[illegible]	Stk	4%	Do. 4% Deb. Stock, Red.	100	[illegible] 99½
[illegible]	10	[illegible]	Belliss and Morcom, Ltd.	10	11½ 12½
[illegible]	Stk	4%	Do. Mort. Deb. 4	100	100 104
[illegible]	10	2½%	Blyth Shipbuilding Co., Ltd.	[illegible]	[illegible]
[illegible]	1	6d.	Bolckow, Vaughan and Co., Ltd., O. Nos. 1-1,629,760	1	0/3 [illegible]
[illegible]	1	[illegible]	Do. Nos. 1,639,101-2,500,000	12/-	11/6–12/-
[illegible]	10	5	Bow, M'Lachlan & Co., Ltd., [illegible] Cum. Pref. Nos. 1 [illegible]	10	[illegible]
[illegible]	15	22/6	[illegible] Henry, Sons & Co., Ld. "A"	15	—
	1	15/	Do. do. "B"	15	
[illegible]		[illegible]	Browett, Lindley & Co. Ord. [illegible]	1	4/0 4/6
[illegible]	1	6%	Do. 6% Cum. Pref.	1	[illegible]
1,160,000	1	4½d	Brown (John) and Co., Lim., Ord., Nos. 1-1,160,000	15/	1 1[illegible]
590,000	1	6d.	Do. Ord., Nos. 1,160,001-1,750,000	1	[illegible]
74,000	10	5	Do. 5% Cum. Pref.	10	11½–11[illegible]
[illegible],634	5	2/6	Cammell, Laird & Co., Ltd., Ord.	5	10½ 10[illegible]
245,045	5	2/6	Do. 5% Cum. Pref.	5	[illegible] — 5½
500,000	Stk	4%	Do. Mort. Deb. 4%	100	[illegible] 101
400,000	Stk	4½%	Do. Mort. Deb. 4½%	100	105–106
600,000	1	—	Cargo Fleet Iron Co., Ltd., Ord.	1	1[illegible] 1
500,000	Stk		Do. 4% First Mort. Deb.	100	95–97
14,400	10	[illegible]	Carnforth Hæmatite Iron	10	15 16
40,000	5	5%	Chamberlain & Hookham, Ltd. Cum. Pref.	5	4½ 5½
62,000	1	6	Chloride Electrical Storage Cum. Pref.	1	[illegible]
100,000	100	4½	Clarke, Chapman & Co., Ltd. 1st Mort. Deb.	100	97–99
450,000	1	[illegible]	Clayton & Shuttleworth, Ltd., Ord.	1	[illegible]
70,000	5	2/6	Do. 5% Cum. Pref.	5	5½–5¾
250,000	Stk	4%	Do. 4% 1st Mort. Db. Stk. Red.	100	100–102
[illegible]	1	[illegible]	Coghlan Steel & Iron Co., L. Ord.	1	19/0–20/0
50,000	1	5½%	Do. 5½% Cum. Pref.	1	19/0–19/6
100,000	10	30/	Consett Iron Co., Ltd., Ord.	7½	[illegible] 30[illegible]
57,031	10	10/	Crossley, Bros., Ld., Ord. 40340/97370	10	15¾ 16
40,359	10	5%	Do. 5% Cum. Pref.	10	11[illegible] 11½
75,000	1	2/6	Delta Metal, Ltd. Shares	1	[illegible] 2½
[illegible]	5	10%	Docker Bros., Ltd.	5	19[illegible]–20[illegible]
[illegible]	5	[illegible]	Do. Cum. Pref.	5	6½–[illegible]
[illegible]	1	3½d.	Dorman, Long & Co., Ltd.	1	[illegible]
400,000	Stk	4%	Do. 4% 1st Mort. Perp. Deb. Stk.	100	94 97
40,000	1	6%	Drakes, Ltd. 6% Cum. Pref.	1	17/0 18/0
25,000	50	4½%	Do. 4½% 1st Mort. Deb.	50	43 — 44

Engineering, Iron and Steel Companies. *Cont'd.*

Present Amount subscribed	Shares	Last Dividend	[illegible]	Paid up	Closing Prices
200,000	[illegible]	[illegible]	Dunderland Iron Ore Co., Ltd., 6% Cum. Pref. and Participating	[illegible]	[illegible]
4,721	13	13	Ebbw Vale Steel, Iron & Coal Co., Ltd.	[illegible]	10¼–[illegible]
69,754	[illegible]	10/-	Do. do. do.	[illegible]	8¾–9
20,250	10	8/-	Elliott's Metal, Ltd.	[illegible]	[illegible]
5,000	10	5%	Do. Cum. Pref.	10	[illegible]
186,748	Stk	4	Do. Deb. 4	100	[illegible]
500,000	1	6d.	Fairbairn, Lawson Combe Barbour	1	[illegible]
300,000	1	[illegible]	Do. Cum. Pref.	1	[illegible]
300,000	100	4%	Do. 4% Mortgage Deb.	100	100–102
25,000	10	6/-	Fairfield Shipbuilding & Engng. Co., Ltd., 6% Cum. Pref.	10	11½–[illegible]
250,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Red.	100	100 [illegible]
[illegible]	Stk		Do. 5% 2nd Mort. Deb. Stk. Red.	[illegible]	[illegible]
126,000	[illegible]	[illegible]	Fraser & Chalmers, Ltd., Ord.	[illegible]	[illegible]
21,000	[illegible]	[illegible]	Do. 7½% Cum. Pref.	[illegible]	[illegible]
10,000	10	[illegible]	Galloways [illegible] Cum. Pref. 18001/28000	10	[illegible]
150,000	Stk	4	Do. 4 1st Mort. Deb. Red.	100	[illegible]
100,000	1	[illegible]	Glover (W. T.) & Co. [illegible] Cum. Pref.	1	[illegible]
100,000	Stk	[illegible]	Do. 4 1st Mort. Deb.	100	[illegible]
[illegible]	10	1	Greenwood & Batley, Ltd., Ord.	1	[illegible]
110,660	10	7	Do. 7 Cum. Pref.	10	10 [illegible]
80,000	100	[illegible]	Do. 5% Deb.	100	[illegible]
965,000	1	1	Guest, Keen & Nettlefolds, Ltd. Ord.	1	2¼ [illegible]
[illegible]	[illegible]	2/6	Do. Cum. Pref.		[illegible]
[illegible]	Stk	4	Do. [illegible] Irred. Mort. Deb. Stk.	100	[illegible]
13,000		2/6	Gwynnes, Ltd., 5% Cum. Pref.	[illegible]	2 – [illegible]
250,000	1	1	Hadfield's Steel F'dry Co., Ld., Ord.	1	[illegible]
20,000	10	4/6	Do. 4½% Cum. Pref.	10	10½–11
30,000	5	3	Hall (J. & E.), Ltd. 6% Cum. Pref.	[illegible]	[illegible]
28,001	5	7/-	Head, Wrightson & Co., Ltd.	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	Hornsby, Richard & Sons, Ltd., Ord. 6% Cum. Pref.	[illegible]	[illegible]
[illegible]	100	4½	Hudswell and Clarke and Co., Ltd. 4½% Deb.	100	85 — 87
140,000	[illegible]	10%	Kings's Norton Metal Co., Ltd.	[illegible]	17 [illegible]
60,000	10	7%	Do. Cum. Pref.	[illegible]	14½ [illegible]
37,500	10	20	Kynoch, Ltd.	[illegible]	17[illegible]
49,537	10	[illegible]	Do. Cum. Pref.	10	10½–[illegible]
15,000	10	5/-	Lanarkshire Steel Ltd., 5% Cum. Pref. Red. Nos. 1—15,000	10	[illegible]
10,000	10	1/-	Do. Cum. Pref. 1899 Red. Nos. 25,001—35,000	10	[illegible]
150,000	3	[illegible]	Leeds Forge Ltd. [illegible]	[illegible]	[illegible]
120,000	[illegible]	7	Do. 7% Pref.	[illegible]	[illegible]
150,000	[illegible]	[illegible]	Do. 1st Mortgage Deb.	[illegible]	51½ [illegible]
[illegible]		04-05	Lond. & Glasgow Eng. & Iron Ship. Ltd. Nos. 1 [illegible]	9	9–10
200,000	1	7½d.	Lysaght (John), Ltd., 6% Cum. Pf.	1	[illegible]
300,000	Stk	4½	Do. 4½% 1st Mt. Deb. Stk., Red.	100	[illegible]
15,000	10	[illegible]	MacLellan (P. & W.) Ltd. Ord. Nos. 15,001—30,000	10	[illegible]
15,000	10	[illegible]	Do. [illegible] C. Pref. Nos. 1 [illegible]	10	11 [illegible]
150,000	Debs	4½%	Do. 4½% 1st Mort. Deb. Red. Nos. 1—1,500	100	[illegible] – 100
40,000	10	[illegible]	Mather & Platt, Ld., 5% Cum. Pref.	10	11 – [illegible]
210,000	1		Measures Bros., Ltd., Ord.	1	[illegible]
75,000	1	6d.	Do. 5½ Cum. Pref.	1	[illegible]
75,000	Stk	4½%	Do. 4½% 1st Mt. Db. Stk. Red.	100	[illegible]
[illegible]	1		Meldrum Bros. 5½% Cum. Pref.	1	17 [illegible]
21,493	[illegible]	2/6	Muntz Metal, Ltd.	[illegible]	[illegible]
[illegible]	5	[illegible]	Do. Pref. 5		4½ [illegible]
150,000	1	[illegible]	National Gas Engine Co., Cum. Pref.	1	23/0–[illegible]
[illegible]	1	[illegible]	Normanby Ironworks, Ord.	1	8/0–9/0
[illegible]	1	[illegible]	Do. 6% Cum. Pref.	1	17/[illegible]
[illegible]	Stk	[illegible]	Do. 4½% 1st Mort. Deb.	[illegible]	[illegible] 77
80,000			North-Eastern Steel Co., Ltd.,		
250,000	Stk	[illegible]	4½% 1st Mrt. Db. Stk., Red.	100	[illegible]
104,910	[illegible]	[illegible]	Palmers Shipbuilding & Iron Co., Ltd. A.	all	[illegible]
[illegible]	1	[illegible]	Do. B.	[illegible]	[illegible]
[illegible]		[illegible]	Do. [illegible] Cum. Pref.	[illegible]	[illegible]
[illegible]	[illegible]		Do. 4% First Mort. Deb.	all	[illegible]
122,000	5	[illegible]	Pearson & Knowles Coal and Iron Co., Ltd., Ord., "B"	5	[illegible]
50,000	5	[illegible]	Do. 6% Cum. Pref. "A"		[illegible]

Stocks and Shares marked * are quoted ex dividend.

Engineering, Iron and Steel Companies.—Contd.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up.	Closing Prices
70,000	10	10/	Pease & Partners, Ltd., Ord.	10	12½—13
300,000	10		Do. Deferred	10	[illegible]
400,000	Stk	4%	Do. 4% Perp. Deb. Stock	100	99—102
1[illegible]0,000	5	3/-	Peebles (Bruce) & Co., Ld., 6% Cm.P.	5	5—5¼
65,000	1	–	Pooley (Henry) & Son., Ltd., Ord	1	10/6—11/6
13,000	5	[illegible]	Do. 5½ Cum. Pref.	5	[illegible]
126,938	[illegible]	2/-	Rhymney Iron Co., Ltd.	5	2⅜—[illegible]
73,062	5	2/-	Do. New	5	[illegible]
330,000	—	5%	Do. 5% Mort. Deb., Red.	100	100—102
350,000	1	1/2	Richardsons, Westgarth & Co., Ltd., Ord. 350,001—700,000	1	—
[illegible]	1	7½	Do. 6%, Cum. Pref.	1	[illegible]
[illegible]0,000	Stk	4½%	Do. 4½% Perp. Deb. Stock	100	99—101
27,500	10	5/-	Rivet, Bolt & Nut, Ld., 5%, Cum. Pref., No. 1-27,500	10	[illegible]
[illegible]0,000	10	5%	Russell John & Co., Ltd. Cum. Pref. 5%	10	9—10
100,000	Stk	4½%	Do. Deb. 4½	100	99—101
35,000	10	12/	Ruston, Proctor & Co., Ltd.	10	11—11¼
250,000	100	4%	Do. Mort. Debs. 4¼% till 19[illegible] then 4%	100	96—98
[illegible]	1	6d	Scott (Walter) Ltd., Ord.	1	13/16—15/16
300,000	1	7½d.	Do. 6%, Cum. Pref.	1	1—1[illegible]
300,000	Stk	4%	Do. 4% Perp. Deb. Stk.	100	92—95
549,700	1	1/-	Sheepbridge Coal and Iron Ord. 250,001/799700	1	28/0—28/6
11[illegible]	1	1	Do. Guar. Pref. [illegible] Min.	1	31/6—32/6
1[illegible]	1	[illegible]	Do. Do. 112,276/250,000	[illegible]	12/6—13/6
111,300	100	5%	Shelton Iron, Steel and Coal Co., Ld. 1st Charge 5% Debs., Red	100	95—98
94,400	100	6%	Do. 6% 2nd Mort. Debs., Red.	100	96—100
250,000	1	2½%	Smith's Dock Co. Ltd. Ord.	1	28—28/6*
20,000	10	5%	Do. 5% Pref.	10	10—10[illegible]
200,000	100	4%	Do. 4% Deb. Stk	100	99—101
100,000	1	1/	Smith & Thomas Stamping Wks. L.	1	2/0—3/0
50,000	Stk	5%	Do. Deb. 5%	100	
250,000	1	1/-	South Durham Steel & Iron, Ltd. Or.	1	1—1
300,000	1	1/2	Do. 6% Cum. Pref.	1	[illegible]—1
300,000	Stk	4½%	Do. 4½% Per. Deb. Stock	100	92—[illegible]
30,000	10	5½%	Spencer John and Sons, Ltd.	10	14½—15½
250,000	100	2[illegible]	Do. 4% Mort. Deb.	100	98—100
[illegible]	100	£4	Staveley Coal and Iron "A"	60	145—147
[illegible]	100	13/4	Do. "B"	10	24¼—2[illegible]
[illegible]	[illegible]	£4	Do. "C"	60	145—147
3,100	10	13/4	Do. "D"	10	24½—25
4[illegible],760	10	[illegible]	Steel Co. of Scotland, Ld., Nos. 1-49,760	9	7½—7[illegible]
1[illegible]240	Stk	5	Do. 5% 1st Mort. Deb. Stk. A Red.	100	109½—109[illegible]
100,000	Stk	[illegible]	Do. 6% 2nd Mort. Deb. Stk. B Red.	100	103—105
85,000	10	1[illegible]	Stewarts & Lloyds, Ltd., Ord.	10	19[illegible]—20[illegible]
57,000	10	6%	Do. 6% Cum. Pref.	10	14—14½
350,000	Debs	[illegible]	Do. 3½% Debs. Red. Nos. 1-3,500	100	94—95½
634,732	1	1	Swan, Hunter & Wigham-Richardson, Lim. Ord.	1	
538,845	1	6d	Do. 5% Cum. Pref.	1	[illegible]—1[illegible]*
240,000	Stk	4¼	Do. 4¼% 1st Mort. Deb Stk. Re	100	[illegible]—100
249,632	1		Talbot Continuous Steel Process Ord.	1	[illegible]—10[illegible]
[illegible]0,000	100	4%	Tannett Walker and Co. 4% 1st Mort. Deb.	100	69—74
300,000	1	6d	Thames Iron Works, Shipbuilding & Engineering Co., Ltd., 5% Cum. Pf	1	[illegible]
200,000	100	4%	Do. 4% Irredeem. 1st Mort. Deb.	100	79—83
148,500	1	5%	Thornycroft John I. & Co., Ltd. Or	1	[illegible]
198,000	1	6	Do. do. 6% Cum. Pref.	1	[illegible]
160,000	Stk	5	Do. do. 5% Deb	100	103—106
[illegible]	1	[illegible]	Tredegar Iron and Coal "A"	1[illegible]	9/6—10/6
208,335	1	[illegible]	Do. "B"	1	15/6—16/6
27,000	[illegible]	6d	Turnbull (Alex) & Co., Ltd. Ord. Nos. 20,001-47,000	1	5/0—6/0
20,000	1		Do. [illegible] Cum. Pref. Nos. 1-20,000	1	9/0—10/0
10,000	10	5/	Tylor (J.) & Sons, Ltd. 5% Cum. Pf.	10	9—9½
$[illegible]	$100	$4	United States Steel Corp. Com. Stk	$100	41¼—41½
$[illegible]	$100	$1¾	Do. 7% Cum. Pref. Stock	$100	108¾—109
$[illegible]	$1000	5%	Do. 10-60yr. 5% Skg. Fd. G. Bds.	$1000	10[illegible]
3,700,000	1	1	Vickers, Sons & Maxim Ltd. Ord.	1	2[illegible]
750,000	1	6d	Do. 5% Non Cum. Pref.	1	1¼—1[illegible]
750,000	Stk	5	Do. 5% Non Cum. Pref. Stock	100	121—123
1,250,000	Stk	4%	Do. 4% 1st. Mort. Deb. Stk. Red.	100	10[illegible]—107
950,000	100	4½%	Do. 4½% 2nd Mort. Debs., Red	100	10[illegible]—10[illegible]
40,000	1	2[illegible]	Walker, C. & W. Ltd.	1	[illegible]
40,000		[illegible]	Do. Cum. Pref.	5	[illegible]
148,530	1	2[illegible]	Wallsend Slipway & Eng. Co. Ltd Ord	all	1 0—[illegible]
[illegible]3,570	1	[illegible]	Do. Cum. Pref.	all	[illegible]
227,000	1	1/2	Weardale Steel, Coal & Coke, Ltd., Def. Ord.	1	1[illegible]
500,000	1	7½d	Do. 6% Cum. Pref. Ord.	1	1
400,000	Stk	4%	Do. 4% Perpetual Deb. Stock	100	93—96
[illegible]	5	3	W[illegible] Ord.	5	1[illegible]

Electrical Manufacturing Companies.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up.	Closing Prices
70,000	1	6d.	Alliance Elec. Co., Ltd. 5% Cum. Pf.	1	[illegible]
125,000	1	7½d.	Aron Elec. Meter Ltd. [illegible] Cum. Pf.	1	[illegible]
120,000	1	1/2⅝	Bell's Asbestos Co., Ltd.	1	1—1[illegible]
10,000	5	7%	British Aluminium Co. Ord.	5	1[illegible]
190,000	[illegible]		Do. Ord.	2	[illegible]
200,000	[illegible]	3/6	Do. Cum. Pref.		¼—[illegible]
286,600	Stk	[illegible]	Do. 5% 1st Mort. Deb. Stk. Rd	100	[illegible]—10[illegible]
100,000	5	3/-	Do. "A" 6% Cum. Pref.	[illegible]	[illegible]
100,000	5	8/-	Do. 4% Funding Certs.	5	2[illegible]
100,000	5	4/-	British Insulated & Helsby Cables Ltd., Ord.	5	[illegible]
100,000	5	3/-	Do. 6% Cum. Pref.	5	[illegible]
500,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Rd	100	10[illegible]—1[illegible]
212,000	Stk	4½%	British Thomson-Houston Co., Ltd. 4½% 1st Mort. Deb. Stk. Red.	100	[illegible]
500,000	5	8/-	British Westinghouse Electric and Manufac. Co., Ltd., 8% Pref.	5	1[illegible]
1,016,353	Stk	4%	Do. 4% Mort. Deb. Stk. Red.	100	80—[illegible]
105,731	2	2/-	Brush Elec. Enging. Co., Ltd., Ord.	2	[illegible]—1
150,000	2	6	Do. 6% Pref.	2	1[illegible]
125,000	Stk	4½%	Do. 4½% Perp. 1st Deb. Stk.	100	97—[illegible]
125,000	Stk	4½%	Do. 4½% Perp. 2nd Deb. Stk.	100	82—84
35,000	5	5/-	Callender's Cable & Constn. Ltd. Ord	5	[illegible]
40,000	5	2/6	Do. 5% Cum. Pref.	5	[illegible]
300,000	Stk	4½%	Do. 4½% 1st Mort. Deb Stk. Red.	100	108[illegible]—110[illegible]
85,000	3	1/6	Crompton & Co., Ltd.	3	2—2¼
100,000	-	5%	Do. 5% 1st Mort. Reg. Debs.	100	[illegible]
52,000	5	10/-	Dick, Kerr & Co., Ltd., Ord.	5	[illegible]
61,000	5	3/-	Do. 6% Cum. Pref.	5	6—[illegible]
300,000	Stk	4½%	Do. 4½% Deb. Stock, Red.	100	104—106
233,334	1	6d.	Doulton & Co., Ltd., 5% Cum. Pref.	1	1⅛—1[illegible]
233,334	Stk	4	Do. 1st Mort. 4% Irred. Deb. Stk	100	10[illegible]—11[illegible]
99,261	5	1/6	Edison and Swan United Electric Light, Ltd., "A" Shares Nos. 1-99,261	3	1[illegible]—1[illegible]
17,139	5	2/6	Do. "A" Shares Nos. 01-017,139	5	2½—[illegible]
327,356	Stk	4%	Do. 4% Deb. Stock Red.	100	[illegible]
72,720	Stk	5%	Do. 5% Second Deb. Stk. Red.	100	[illegible]
112,100	2	1/7½	Electric Construction Co., Ltd.	2	[illegible]
31,390	2	2/9⅗	Do. 7% Cumulative Pref.	2	[illegible]
200,000	Stk	4%	Do. 4% Perp. 1st Mt. Deb. Stk.	100	[illegible]
50,000	Stk	4½%	Do. 4½% Perp. 2nd Mt. Deb. Stk.	100	
10,248	10	7/6	Evered and Co., Ltd.	10	[illegible]
25,000	10	5/-	Gen. Elect. Co. Ltd., 5% Cum. Pref.	10	[illegible]
200,000	Stk	4%	Do. 4% 1st. Mt. Deb. Stk., Red.	100	[illegible]
40,000	5	1[illegible]	Henley's (W. T.) Telegraph Works Co., Ltd., Ord.	5	1[illegible]—1[illegible]
40,000	5	2/3	Do. 4½% Cum. Pref.	5	[illegible]
150,000	Stk.	4½	Do. 4½% Mort. Deb. Stk. Red.	100	10[illegible]—11[illegible]
50,000	10	15	India Rubber, Gutta Percha & Telegraph Works Co., Ltd.,	10	17—1[illegible]
400,000	100	4	Do. 1st Mort. Deb. Red.	100	[illegible]
100,000	1	3/-	Scott (Ernest) & Mountain, Ld., Ord.	1	17—17/6
[illegible]	12	24/-	Telegraph Construction and Maintenance Co., Ltd.	12	[illegible]
150,000	100	4%	Do. 4% Deb. Bonds	100	[illegible]
150,000	1	1/7½	United Electric Car Ord.		[illegible]
50,000	Stk.		Do. [illegible] 1st Mort. [illegible]	100	103—104
100,000	1	6	Do. [illegible] Cum. Pref.		[illegible]

Locomotive Builders.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up.	Closing Prices
200,000	1	5/	Beyer, Peacock and Co., Ltd., Ord.	1	[illegible]
300,000	1	[illegible]	Do. 5½% Cum. Pref.	1	1[illegible]
300,000	100	4¼	Do. 4¼% Red. Deb. Stock	100	[illegible]
475,000	10	7[illegible]	Hawthorn, Leslie & Co., Ltd. Ord	10	[illegible]
[illegible]	100	[illegible]	Manning, Wardle & Co., Ltd. 5% 1st Mort. [illegible]	100	100—101
1,000,000	10	[illegible]	North British Locomotive Ord.	10	[illegible]
750,000	10	[illegible]	Do. 5% Cum. Pref.	10	1[illegible]
250,000	10		Stephenson (Robert) & Co., Ltd., Or.	10	[illegible]
250,000	10		Do. 5½% Cum. Pref.	10	1[illegible]
250,000	100	4	Do. 4% [illegible]	100	[illegible]
[illegible]	1	1[illegible]	[illegible]		[illegible]
[illegible]	1		Do. [illegible]		[illegible]

Stock and Share marked * are quoted ex-dividend.

New Patents Applied For.

Engineering—Civil, Mechanical, etc.

[illegible] Improvement [illegible] safety couplings [illegible].

[illegible] Improvements [illegible] couplings for railway and other rolling stock. 6,409.

[illegible] Improvements in ball bearings. 6,147.

[illegible] Roulements [illegible] London. Improvements in or relating to ball bearings. [illegible]

BOILER FEED VALVES.—J. G. Reid, London. Improvements in or relating to boiler feed valves or the like. 6,489.

BORING APPLIANCES.—L. G. Lawson, London. Improvements in boring or drilling appliances. 6,007.

——————F. Kresl, London. Improved carriage for boring and undercutting machinery. 6,016.

BREAKWATERS.—J. Worthington and H. Worthington, Morecambe. Improvements in the construction of breakwaters for the prevention of erosion of land bordering on sea coasts and rivers and for accumulating deposits. 6,050.

CHUCKS.—G. E. Witherell, London. Improvements in and relating to chucks. 6,184.

COAL CUTTING.—H. Hirst, Leeds. An improvement in or in connection with the tool holders of coal cutting machines. [illegible]37.

[illegible] Manchester. Improvements in apparatus for [illegible] and separating coal and the like. [illegible]

Share List—*Continued.*

Railway Carriage and Wagon Companies.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up	Closing Prices
10,000	10	7/6	Birm. Rail.-Car.&Wagon,L..1-10,000	10	25 — 25½
8,739	10	3/-	Do. Second Issue 1-8,739....	4	9[illegible] –10
10,000	10	6/-	Do. Cum. Pref. 6% 1-10,000..	10	13½ -14
197,221	100	4%	Do. Deb. 4%	100	102 -10[illegible]
50,000	10	10	Bristol and South Wales Railway Waggon, Nos. 1–50,000	3	5¾ — 5[illegible]
8,000	20	-	Bristol Wagon & Carriage Works Nos. 1–8,000	10	17[illegible] –18¼
5,000	20	-	Do. 1875, Nos. 8,001–13,000	2	3 — 3¼
2,000	20	-	Do. 5 p.c. Participating Pref Nos. a1–a2,000	10	18¼ –18¾
30,111	7	7/-	Gloucester Rail. Car. & Wagon, Ld., A, 1-29,861 & 49,751-50,900	7	10[illegible] 10[illegible]
44,889	7	3/6	Do. B, 29,862-49,750, 50,001-75,000	7	4½– 4¾
10,000	10	6%	Lancashire and Yorkshire Wagon..	10	12½ 13
14,567	10	15%	Lancashire Wagon, Ord.	2	2[illegible] 2[illegible]
4,150	10	5%	Do. do Pref.	10	10[illegible] 10[illegible]
781,808	1	9d.	Metropolitan Amalgamated Rail.-Carriage & Wagon, Ld., 1-781,808	1	44/0 44/6
164,288	1	6d.	Do. Cum. A Pref. 5%, 1-164,288	1	[illegible]4/0—24/[illegible]
235,000	1	7½d.	Do. Cum. B Pref. 6%, 1-235,000	1	28/0 29/0
200,000	20	20/	Midland Rail.-Car & Wagon, Ld., 1-20,000	10	20 –21
10,000	6	10	Western Wagon and Property Nos. 1–10,000	6	12 12¼
40,000	6	10	Do. Nos. 10,001–50,000	2	4[illegible] 4½

[illegible] London. Improvements [illegible]

CONVEYORS.—[illegible] Improvements [illegible] method of and means for conveying or transferring coal or other [illegible]

DRILLING [illegible] Improved [illegible] for drilling, boring, or otherwise operating on articles particularly for drilling transverse holes in tube lengths. [illegible]

DYNAMOMETERS.—F. Sellars, London. Improvements in or relating to dynamometers. 6,38[illegible].

FANS.—The Electric and Ordnance [illegible] Ltd., R. Hancock, and R. F. [illegible] Birmingham. Improvements in the casings of centrifugal and other fans. 6,245.

FEED-WATER HEATERS.—[illegible] Liverpool. Improvements in and connected [illegible] feed water heaters. [illegible]

FURNACES.—A. Ducco, London. Improvements [illegible] furnaces. 5,997.

———A. Gardner, Southampton. Improvements in connected with supplying air, heated air, superheated steam, or hot gases, to the furnaces of steam generators, or other furnaces. 6,043.

———J. Hall, London. Improvements relating to gas and other furnaces. 6,497.

———T. B. HULSE, Liverpool. Improvements in and connected with smoke consuming furnaces and other devices, and methods of utilising the heat from the same. 6,40[illegible]

———P. M. Justice, London. Improvements in [illegible] particularly those of the [illegible] type. [illegible]

———P. R. Kuehnrich, [illegible] Improvements in or relating to electric furnaces. [illegible]

———W. G. Moore, Birmingham. Improvements in and relating to the removable bottoms of annealing [illegible] and the like. 5,917.

———Steel, Peech, Tozer, [illegible] Pursglove and R. Benton, Sheffield. Improved mechanism for reversing the gas and air valves in regenerative furnaces. 6,039.

GAS ENGINES.—The Anti-Attrition Metal Company [illegible] and H. K. Stark, London. Improvements in, and relating to, starting gear for motor cars, gas engines and the like. [illegible]

GAS PRESSURE REGULATION.—F. W. Howarth, London. Improvements in gas pressure regulating devices. 6,425.

GRINDING [illegible] Wellington [illegible] An improved [illegible] grinding [illegible]

HYDRAULIC PRESSES.—F. Ande, London. Improvements in or relating to hydraulic presses. 6,185.

LOCOMOTIVES.—W. Valentine, Bradford. An improved pneumatic or like machine for breaking stay bolts and rivets in locomotive fireboxes during repairs. 6,233.

LUBRICATING.—L. Chapman and W. H. Knowles, London. Improvements in lubricating compounds. 6,289.

[illegible] London. [illegible] machines and the like. [illegible]

[illegible] Improvements [illegible] machines. 6,112.

[illegible] London. [illegible] conduits and in tubular fittings. 5,992.

[illegible] London. [illegible]

——[illegible] Blackman [illegible] provements in steam pumps. 6,424.

——[illegible] Liverpool. [illegible]

Punching Machines.—A. Wilzin, London. Improved means for feeding sheets of metal and other material to a punching [illegible]

[illegible] London. [illegible]

——J. [illegible] London. [illegible] fluid engine or motor. 5,990.

[illegible] An improved semi-rotary fluid pressure motor. 6,388.

——R. W. [illegible] London. [illegible] rotary motor or pump. 6,493.

Screw Threads.—H. W. Lake, London. Improvements in machines for cutting screw threads. 6,082.

Sighting Gear.—F. Krupp Akt.-Ges., London. Improvements in or relating to the sighting gear of barrel recoil ordnance. 5,960.

Slide Valves.—T. King, London. An improved engineer's tool for use in setting engine slide valves and like operations. 6,495.

Sluice Gates.—A. T. Mirza, London. Improvements in or relating to sluice gates or shutters. 6,100.

Spark Arrester.—W. G. Argent and A. C. James, Silvertown. Combined spark arrester and ash conveyor for locomotive or similar engines. 5,906.

[illegible] W. Waller, London. Improvements [illegible] apparatus for stamping or perforating sheet metal [illegible] other material. 6,447.

[illegible]

Steam Boilers.—C. McCallum, Glasgow. Improvements in and connected with apparatus for automatically circulating and filtering water in steam boilers. 6,470.

——J. Fischer, Berlin. Improvements in an indirectly heated steam generator. 5,936.

[illegible] An improved steam engine. 6,037.

——A. G. Kent-Johnston and W. H. Barnett, London. A new or improved engine using steam or other expanding fluids under pressure. 6,514.

Steam Traps.—C. Barter, London. Improvements relating to steam traps and the like appliances. 6,031.

——R. H. Paterson, London. Improvements in and relating to steam traps. 6,004.

——O. Lindemann, London. Improvements in steam traps. 6,192.

Turbines.—Bellis and Morcom, Ltd., and A. Jude, London. Improvements in turbines which are operated by expansible [illegible]

——F. Bosshardt, Manchester. Improvements in steam and gas turbines and the like. 6,229.

——[illegible] relating to elastic fluid turbines. 6,225.

Valves.—J. Hopkinson, R. Kilburn, and J. Hopkinson and Co., Ltd., London. Improvements in automatic check [illegible]

[illegible]

[illegible] in or relating to valve gears. 6,503.

[illegible] Birmingham. Improvements in or relating to wire ropes. [illegible]

Shipbuilding, etc.

[illegible] propellers. 5,979.

——[illegible] screw propellers, fans, and the like. 6,213.

——S. J. Lawrence and F. A. Glenn, London. Im[illegible] 6,368.

[illegible] Ltd., Glasgow. An improved sinker for use with navigational sounding machines, also an improved attachment between the stray line and the wire on the sounder reel. 6,471.

Steering Machinery.—Davis and Co., Ltd., and J. L. Boothman, London. Improvements in and relating to apparatus for use in connection with steering machinery for ships and the like. 6,163.

[illegible] London. Improvements in the means for navigating and manœuvring submarines with provision for enhancing the safety both of crew and submarine. 5,904.

——[illegible] Improvements in or connected with conning towers or like deck structures of submarine navigable boats or vessels. [illegible]

Submarine Signalling.—J. Gardner, Manchester. Improvements in the generation of sound for use in submarine signalling and the like. 6,230.

[illegible] coals and other suitable materials from ships and other [illegible] like and other receptacles. 6,377.

Warship Construction.—J. B. W. Maunder, London. [illegible]

Iron and Steel Metallurgy, etc.

[illegible] ing to billet casting apparatus. 6,008.

[illegible] method of and apparatus for casting links in chain form. 6,492.

[illegible]

[illegible] machines for making metal rods or bars. 6,315.

[illegible] A new or improved process for the treatment of metallic ores. 5,989.

[illegible] apparatus for feeding roller mills. 6,501.

Steel.—A. Tropenas, Sheffield. Improvements in the manu[illegible]

[illegible]

New Catalogues.

Fielding and Platt, Ltd., Gloucester. A catalogue that will find a place in our library owing to its completeness and the excellence of its illustrations, has been issued by the above firm in connection with their well-known hydraulic machinery. Among other plant described in its 219 quarto pages, may be mentioned stationary and portable riveters, travelling plants for riveting *in situ*, belt and gear-driven pumps, hydraulic accumulators and intensifiers, presses, punching and shearing machines, etc. In fact, there appears to be nothing in the way of hydraulic machinery the firm do not undertake.

Pollock, White and Waddel, [illegible] N.B. [illegible] firm's new combined key-seating and slotting machine is described and illustrated in a special pamphlet. We gather that the tool-bar has a 15-in. travel, and quick return motion. The cutting tool has a simple automatic relief movement on the up-stroke. The stroke can be altered instantaneously. The compound table has a 12-in. power feed in either direction.

R. Waygood and Co., Ltd., London, E.C. The latest [illegible] passenger lifts on ocean liners, a circumstance which reminds us that the modern liner is becoming more and more like a floating hotel. One of the firm's direct-coupled electric passenger lifts and some service lifts were recently fitted on the s.s. *Amerika*. During the first voyage of the steamer, the passenger lift made 2,154 journeys and carried 4,469 passengers, without any hitch or stoppage, and during rough weather the instruments showed a rise of only about 2½ to 3 amperes in excess of the ordinary current readings. A coloured eight-page illustrated list has also been issued dealing with the firm's specialities in general.

Bedford Engineering Company, Bedford. Illustrated post-cards of large size are being used by the firm to draw attention to their crane specialities. An interesting fact about these cranes is that they can now be fitted with a patent automatic safety device which stops the engines in the event of the driver attempting to lift an excessive load at any radius.

George Richards and Co., Ltd., Broadheath, near Manchester. An illustrated catalogue describes the firm's machine tools, pattern making machinery, air compressors, pulleys and line shaft fittings. Pearn's patent "Universal" facing and boring machine is called attention to as the first tool designed for facing and edging flanged pipes, elbows, bends, tees, and facing and boring seats for valves. By the simple attachment of a boring stay, the machine can be used [illegible] a slide-rest on the table, and substituting a face-plate for the facing-head, it may be used with advantage for turning and boring small fly-wheels and pulleys; and by providing automatic cross feed to the table and automatic vertical feed to the spindle slide, the machine becomes a valuable tool for facing and milling plain [illegible]

The Electrical Company, Ltd., London. The firm's latest publication is entitled "Electric Cooking and Heating Apparatus." Its interest is rather of the domestic than the engineering order. One may learn how to heat beds, warm water, make tea, or warm the house—all by electricity.

Arthur Cort and Co., 277, Camberwell New Road, S.E., forward their wholesale price list of red, grey or black insulating hard or flexible vulcanised fibre, in sheets, tubes, rods, washers, valves, etc.; also details of their [illegible]

The Newall Engineering Company, Ltd., Warrington. A well-printed and illustrated catalogue of workshop gauges has been issued, including measuring machines, limit and other gauges, micrometers, surface plates, etc. We note that a pamphlet can also be obtained on "Limits and Limit Gauges," which contains tables of allowances for various classes of fits, and an amount of information that will be found useful to any en[illegible]

Books Received.

"Our Waterways." A history of inland navigation considered as a branch of water conservancy. By Urquhart A. Forbes and W. H. R. Ashford. John Murray. 12s. net.

"Pig Iron Statistics." Twenty-fourth year of publication. Containing fifty-three years' statistics Scotch iron, thirty years' statistics Cleveland iron, and twenty-four years' statistics Hematite, together with the highest and lowest prices of copper and tin for the past forty-two years. Published by E. W. Crawley, warrant and iron merchant, 14, Park Row, Leeds. Price 1s., post free.

Forthcoming Exhibitions.

Great Britain.

[illegible] The Essex County General and Industrial Exhibition, [illegible]

Bath and West of England Agricultural Society, Swindon, May [illegible]

Royal Agricultural Society's Show, Derby, June [illegible]

Bath and West of England Agricultural Society, Newport, [illegible]

London, Engineering and Machinery [illegible] Olympia, September [illegible]

London, Austrian Exhibition, Earl's Court, May [illegible]

Abroad.

Bucharest, International, June [illegible] December, [illegible]

Milan, International, May—October, [illegible]

Motor Cars, International, Turin, February, 1906.

Nuremberg General Industrial, May—October, 1906.

[illegible] Preserved Food Products, Berlin, June [illegible]

Fine Arts and Industries, Paris, June—October, 1906.

Motor Cars, Buenos Aires, September, 1906.

[illegible] November [illegible] February [illegible]

Christchurch, New Zealand, November [illegible] April [illegible]

Meetings, etc., for the Ensuing Week.

Friday, March 30.—Royal Institution, Professor P. Zeeman on "Recent Progress in Magneto-Optics."

Saturday, March 31.—Royal Institution at 3 p.m., Professor J. J. Thompson on "The Corpuscular Theory of Matter."

Monday, April 2.—Society of Engineers, Royal United Service Institution, Whitehall, Ordinary meeting: Paper, "Harbour Exigency Works," by Mr. Frank Latham, M.Inst.C.E.—Institution of Marine Engineers, Romford Road, Stratford, "Fuel-Testing."—Society of Arts, John Street, Adelphi, W.C., Cantor Lecture, "Fire, Fire Risks, and Fire Extinction."

Tuesday, April 3.—Institution of Civil Engineers, Great George Street, Ordinary meeting at 8 p.m.

Wednesday, April 4.—Society of Arts, Ordinary meeting, 8 p.m.

Thursday, April 5.—Royal Institution, Professor B. Hopkinson, "Internal Combustion Engines."—Civil and Mechanical Engineers' Society, Ordinary meeting.

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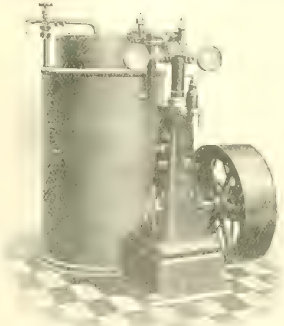

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PAGE'S WEEKLY Miscellaneous

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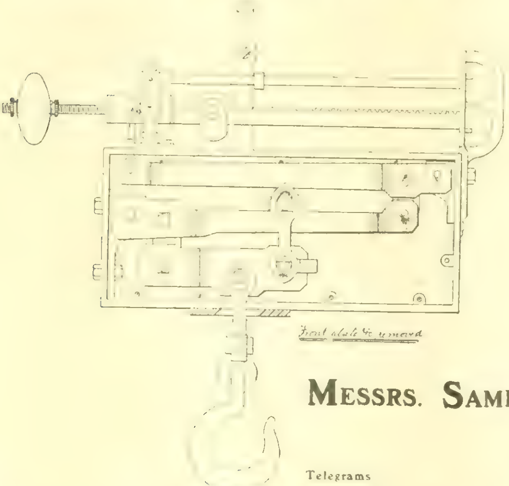

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Hunslet Moor,
Near LEEDS.

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"WEIGH, LEEDS."

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SEA-GOING TORPEDO BOATS AND CRUISERS
With Speeds up to 36 knots per hour.

TORPEDO-BOAT DESTROYER FOR THE IMPERIAL CHINESE NAVY.
Speed, with complete outfit [illegible] in the bunkers 35·2 knots [illegible] knots [illegible]

The Largest Ironclads and Mail Steamers. Steamers for Sea and River Service. Dredgers.
STEAM ENGINES AND LOCOMOTIVES OF DIFFERENT TYPES.
Works founded in 1837, employ at present 6,500 Workmen.

PAGE'S WEEKLY Engines, &c.

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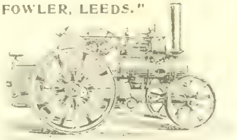
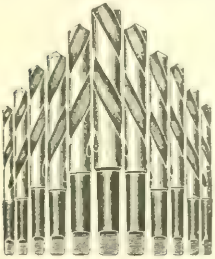


Steam Rollers, Portable Railways, &c., &c.



Twist Drills,
Taps,
Milling Cutters,
Reamers.

H. F. SCHNICKE,

CHEMNITZ (Saxony).

THE HUNSLET ENGINE CO., LTD.

LEEDS.

MANUFACTURERS OF

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Designs and Specifications Supplied or Worked to.

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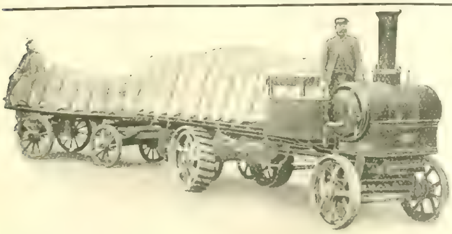

This Illustration [illegible] a Steam Wagon to carry 6 Tons and [illegible] 4 Tons on a Trailer.

THE . .

Yorkshire Patent Steam Wagon Co.

[illegible]

Pepper Road, Hunslet, Leeds.

MAKERS OF

STEAM MOTOR WAGONS

To suit any trade purpose, and to carry 3, 4, 5, and 6 tons.

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BALDWIN LOCOMOTIVE WORKS.

BROAD AND NARROW GAUGE **Locomotives** SINGLE EXPANSION & COMPOUND

Mine, Furnace and Industrial Locomotives.

Electric Locomotives with Westinghouse Motors and Electric Trucks.

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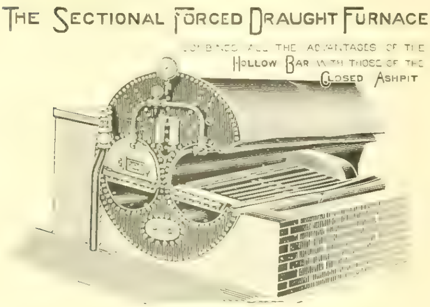
Cable Addresses: "Baldwin, Philadelphia", "Sanders, Lond." General Agents: SANDERS & CO. 110 Cannon St. London E.C.

PAGE'S WEEKLY Stokers, &c.

FORCED DRAUGHT.


THE SECTIONAL FORCED DRAUGHT FURNACE
COMBINES ALL THE ADVANTAGES OF THE HOLLOW BAR WITH THOSE OF THE CLOSED ASHPIT

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Fitted to any type of Boiler.

Special Furnaces for Coal Washery and General Trade Rubbish.

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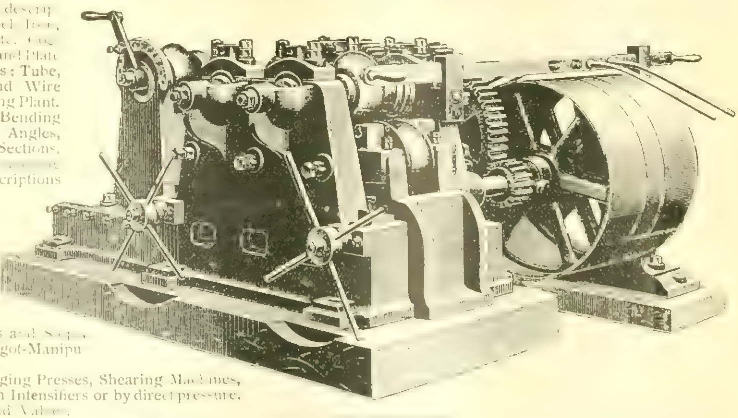
ARMLEY, LEEDS.

MASCHINENFABRIK SACK, G.m.b.H.,

RATH, near DUSSELDORF, GERMANY.



Rolling Mills of all descriptions for Rolling Steel, Iron, Copper, Brass, Zinc etc. Cogging Mills, Rail Bar and Plate Mills; Universal Mills; Tube, Tyre, Disc-wheel and Wire Mills; also Cold-rolling Plant.

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Forging and Flanging Presses, Shearing Machines, etc., worked by Steam Intensifiers or by direct pressure. Hydraulic Pumps and Valves.

THE ERECTING SHOP OF THE MASCHINENFABRIK SACK CAN DEAL WITH PIECES WEIGHING UP TO 60 TONS.

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"BENNIS" Stokers.

And **BURN** your fuel instead of **WASTING** it; **SAVE** your time instead of **SQUANDERING** it: **ABOLISH** your **SMOKE** instead of **IGNORING** it; **REDUCE** your Costs and **SAVE** a **FORTUNE** in your **FURNACES**.

Burn the
CHEAPEST
Fuel
you can buy.

WE will **SAVE**
you from
SMOKE.

WE will
SECURE you
EFFICIENCY.

CHEAP Steam.

LOW COSTS
FOR
REPAIRS.

FREE
Surveys and
Estimates.

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You have YET to BEAT a Coal Cost per UNIT of

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Obtained at **NEEPSEND** Electric Light and Power Station, **SHEFFIELD** on TRIALS extending over TEN WEEKS.

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To work for CHEAP STEAM and a SMOKELESS CHIMNEY **WITHOUT** [illegible] "BENNIS" PATENT AUTOMATIC STOKERS [illegible] **FUTILE as BITING on GRANITE.**

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SCHIEREN TANS

in this, the 'Dixie' Tannery, and

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BELTING

[illegible]
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ity and economy.
[illegible]
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Send for our Dixie Belt [illegible]

Chas. A. Schieren & Co.

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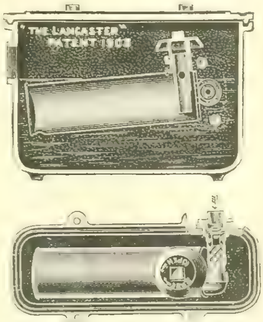
PAGE'S WEEKLY Steam Traps, &c.

'THE LANCASTER'
(R.T.M.)

STEAM TRAPS



Work at any pressure without lid—therefore easily examined. When at rest the ball is at the bottom of the box, and the valve full open—hence impossible to close the drain by accident. The valve being loose cannot stick.

They are thoroughly reliable, durable, and economical. For full particulars write for Catalogue CT.

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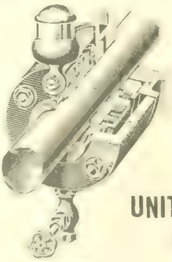
Quality is Our First Consideration.

For over Eighty Years we have been [illegible] Leather Belting, [illegible] present [illegible] in a position to supply Oak Tanned Leather Belting [illegible] reasonable [illegible] [illegible]



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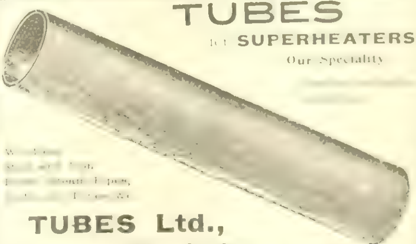

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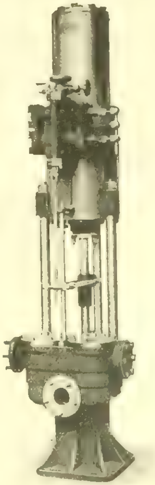

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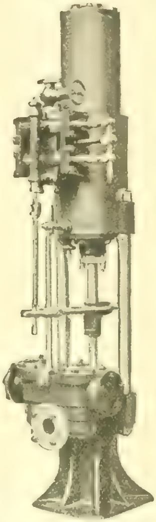

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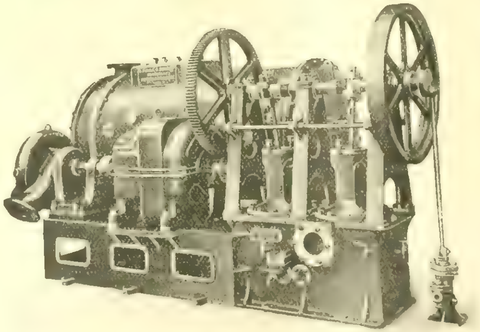
This set to deal with **10,000 lbs.** Exhaust Steam per hour.



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OIL
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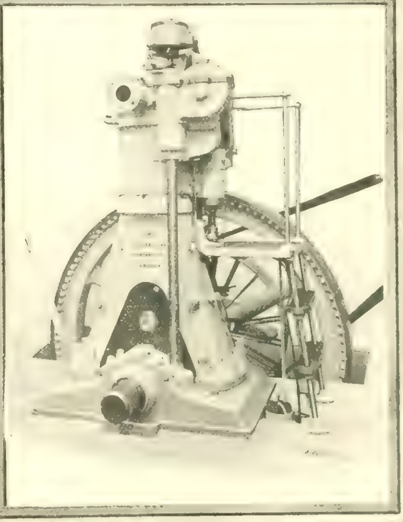

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TELEGRAPHIC ADDRESS
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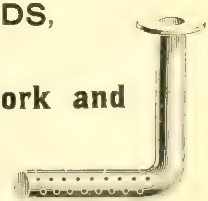

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Buildings Designed and Erected in all Parts of the World.
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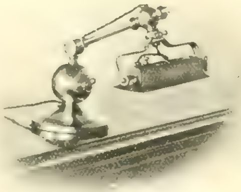

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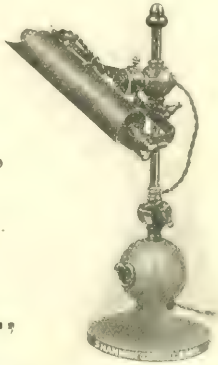
as you lower the
Curtain.



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THE LIGHT CAN BE THROWN WHEREVER REQUIRED
WITHOUT MOVING THE LAMP.
IT SHADES AND PROTECTS THE EYES.
The Switch is in the Standard. No plugs or wall pins to pull out.
"IT IS INDEED A WONDERFUL LAMP"
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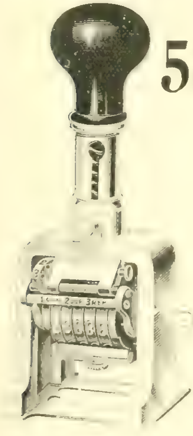

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"An extremely tasteful piece of work, perfectly produced."

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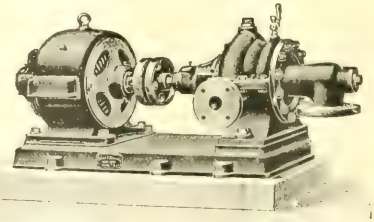

Made for any capacity for all lifts, with highest efficiency, specially for direct coupling with Electromotors, also high-speed Electrical Plunger Pumps for all services.

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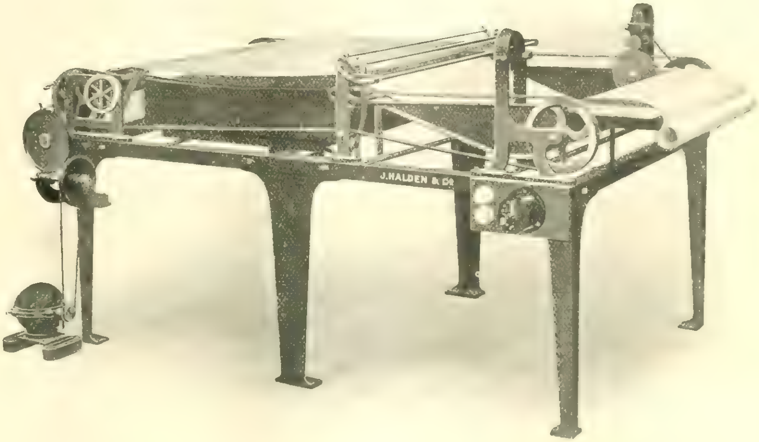

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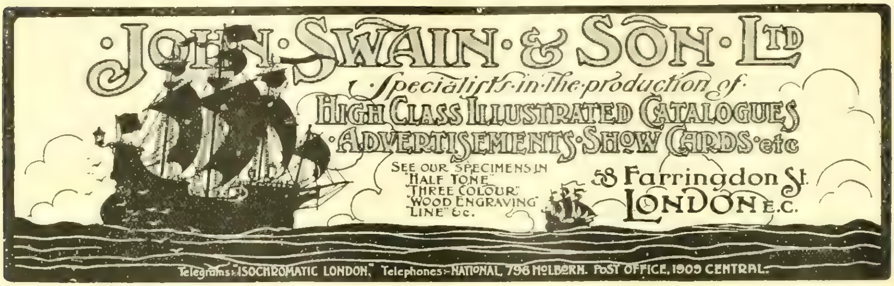

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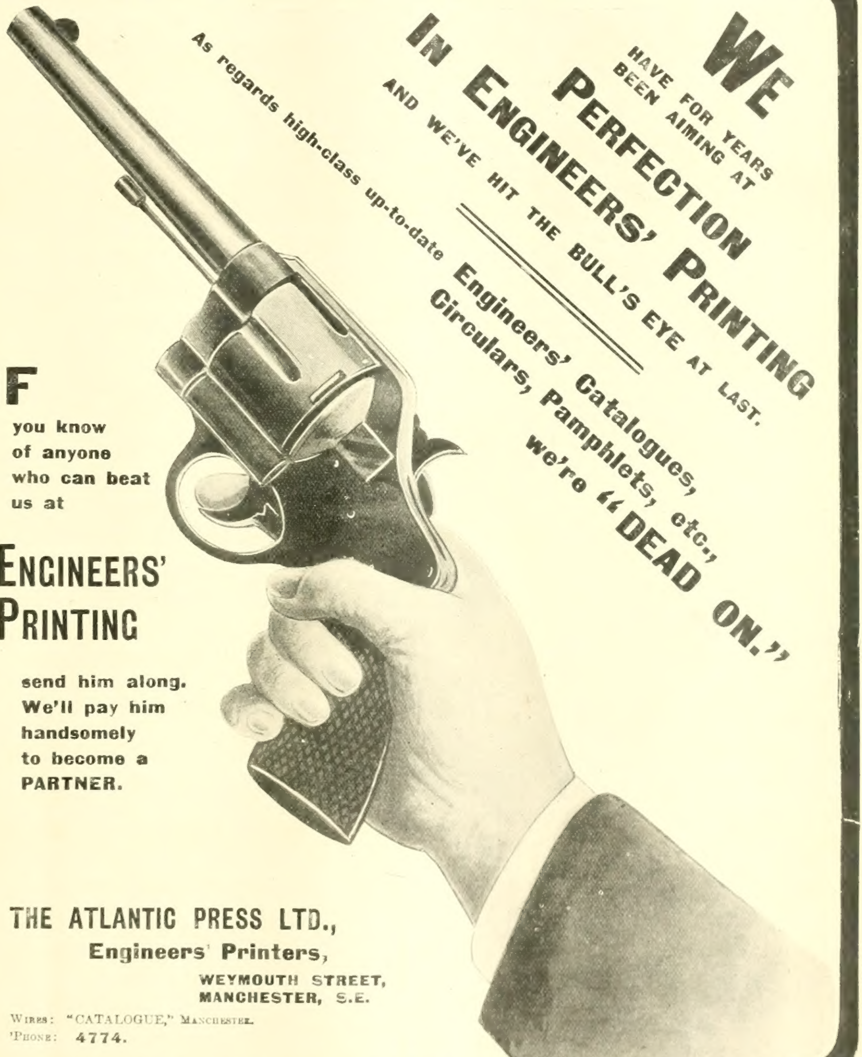

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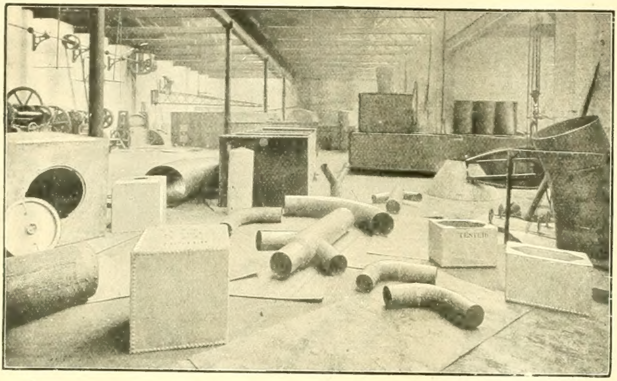

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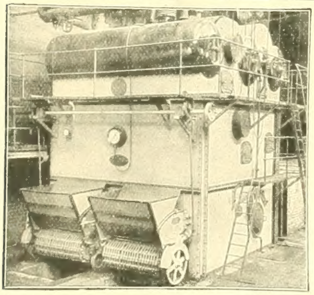

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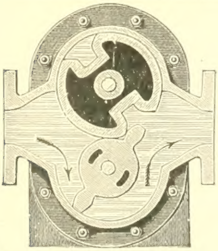

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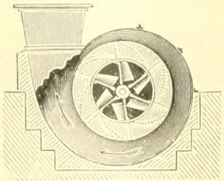

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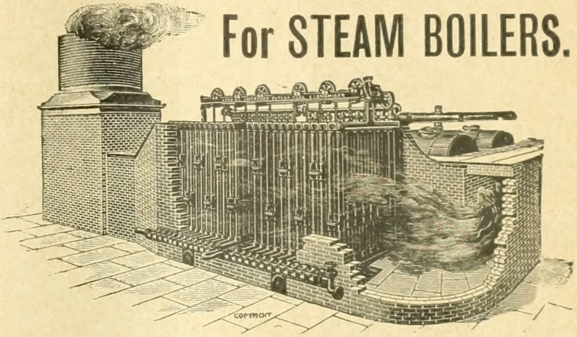

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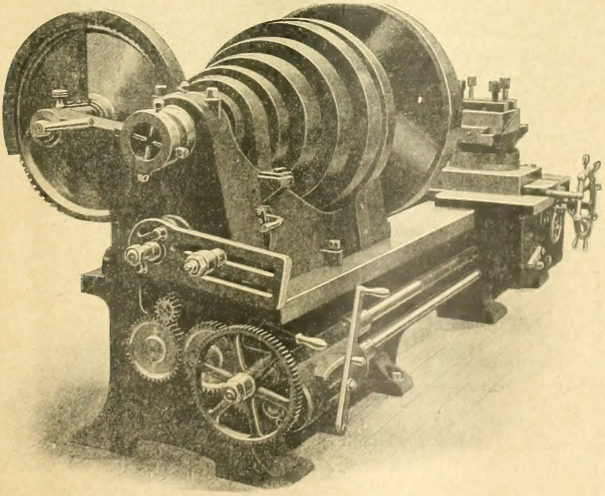

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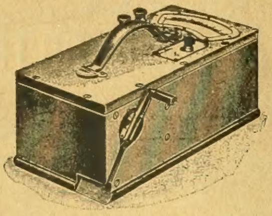

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